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ABSTRACT

A Congressional hearing on noise-induced hearing loss, an often overlooked health issue, was held to determine the extent of the problem in children and youth. Congresswoman Patricia Schroeder, who presided, cited the effects of repeated exposure to loud sounds over a period of time, including the role that personal stereos and some common household items can play in hearing loss. The electronics industry was invited to participate in the hearing but was not represented. A fact sheet prepared for the record gives statistics on the number of Americans who are hearing-impaired and summarizes research on the exposure of children and youth, the special hazards of personal stereo use, prevention measures, and the effects of exercise, alcohol, and smoking on hearing. Included are prepared statements and testimony from congressmen from Illinois and Missouri, and from witnesses representing such groups as the record industry, the Central Institute for the Deaf, the University of Michigan Medical Center, the National Institutes of Health, Self-Help for Hard of Hearing People, Hearing Education and Awareness for Rockers, the Car Audio Specialists Association, and the American Speech-Language-Hearing Association. Statements on exposure to firecrackers and the times when a child's hearing should be tested are also included. (LB)

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TURN IT DOWN: EFFECTS OF NOISE ON HEARING LOSS IN CHILDREN AND YOUTH

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HEARING

BEFORE THE

SELECT COMMITTEE ON CHILDREN, YOUTH, AND FAMILIES HOUSE OF REPRESENTATIVES

ONE HUNDRED SECOND CONGRESS

FIRST SESSION

HEARING HELD IN WASHINGTON, DC, JULY 22, 1991

Printed for the use of the
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TURN IT DOWN: EFFECTS OF NOISE ON HEARING LOSS IN CHILDREN AND YOUTH

MONDAY, JULY 22, 1991

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE ON CHILDREN, YOUTH, AND FAMILIES,
Washington, DC.

The select committee met, pursuant to call, at 9:30 a.m., in room 2175, Rayburn House Office Building, Hon. Patricia Schroeder (chairwoman of the select committee) presiding.

Members present: Representatives Schroeder, Durbin, Wolf and Barrett.

Staff present: Karabelle Pizzigati, staff director; Jill Kagan, deputy staff director; Thomas Brooks, professional staff; Nancy Reder, professional staff; Danielle Madison, minority staff director; Carol Statuto, minority deputy staff director; Kate Bunting, research assistant; and Joan Godley, committee clerk.

Chairwoman SCHROEDER. Let's call this hearing to order and find out what our hearing is all about.

Let me say, first of all, we know we have one hearing-impaired individual in the audience. If there is anyone else, we do have a signer over here, if you care to move closer or whatever. Let me just point that out as an informational item.

Secondly, we know that noise-induced hearing loss is very serious, but often overlooked as a health issue. Congressman Durbin has been phenomenal in bringing this issue to our attention, and we are very, very happy he suggested we hold this hearing today and get started on trying to catch up for a long lost time.

When you think about your own home, the personal stereos, the electric lawn mowers, whether or not you played in the school band, if you have gone to rock concerts, if we have been around fireworks, they produce dangerously high sound levels.

In fact, while the sound levels may be regulated in the workplace, we don't think about them at all in our leisure or home activities. We also know—we have documented evidence that repeated exposure to loud sounds over a period of time can lead to noise-induced hearing loss.

That is not a big surprise. That is why we have been so aggressive in dealing with it in the workplace. Of the 28 million people in the U.S. who suffered from hearing loss, more than a third of these impairments are at least partially attributed to this exposure to loud sounds.

We are trying to find people who have done research on the extent of this problem, but we found that it was impossible. In

Great Britain, they tried to look at this, but they couldn't find a control group of children who hadn't been exposed to all these noises.

This morning, we will hear a lot of different things. We will hear about a recent study of noise-induced hearing loss. Another studied comfortable listening levels from a whole series of personal video stereos and stereo users.

We will have a demonstration of how loud some common household items can be. You see them down here.

We know noise-induced hearing loss is almost always preventable. It is very vital we start making sure our children and teenagers know how important it is to start taking better care of their hearing.

I want to say for the record, the electronics industry was invited to participate this morning, but they declined to do so. We hope we will hear from them at a later date. We hope they will work with us and not against us in trying to get this information out.

We are going to look at a range of preventive measures this morning. The kind of news you can use and different education programs that help teenagers and children to continue to enjoy their activities, but not endanger their hearing.

When you go out shopping at Christmas time, they always say, these are safe toys, but they never deal with hearing. We look at safety from a lot of different ways, but we have not looked at it in terms of hearing.

When we look at how quickly we get children into noisy toys, this one is actually pretty safe. It is called "My First Sony." It does have some protection. It kind of gets you into the big ones that don't, and it gets you moving in that direction.

We don't want to say they haven't done the right thing here; they are saying it is safe for children 6 and up, because of what they have been able to do. I think we need to be talking about what happens when children get older and more mature and cool and need the big one, then what are we doing?

We haven't prepared them at all at that point. I think we will have some very interesting information come out, and some things that have been long overlooked. I want to thank everyone for coming.

[Opening statement of Hon. Patricia Schroeder follows:]

OPENING STATEMENT OF HON. PATRICIA SCHROEDER, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF COLORADO AND CHAIRWOMAN, SELECT COMMITTEE ON CHILDREN, YOUTH, AND FAMILIES

This morning the Select Committee will explore a serious, but often overlooked health issue: the effect of noise on hearing loss in children and youth and how it can be prevented.

I want to thank my esteemed colleague, Mr. Durbin, for bringing this issue to the attention of the Select Committee and for suggesting that we hold this hearing today.

We are all potentially at risk for damaging our hearing because of loud noises. Metro trains, jets taking off over our heads, highway and building construction are typical sounds that are painful to our ears. We also are affected by dangerously high noise levels in our leisure time pursuits as well. Our children are particularly at risk because some of their favorite activities can harm their hearing.

Such activities as wearing stereo headphones, using an electric lawn mower, playing in the school band, eating lunch in the school cafeteria, going to rock concerts, setting off firecrackers, and even some of the "noisy" toys that toddlers and pre-

schoolers play with—all result in noise levels above 85 decibels. These levels are considered hazardous in the workplace and require protective measures. But sound levels from leisure activities are not regulated and most participants in these activities do not protect themselves by wearing earplugs like those being distributed at the hearing this morning.

Repeated exposure to loud sounds over a period of time can lead to what the experts call "noise induced hearing loss." It usually happens gradually over a period of time, although a one-time exposure to a particularly loud sound can produce an immediate hearing loss, that may or may not be reversible.

Early last year the National Institutes of Health held a conference on noise induced hearing loss and developed a consensus statement reflecting the widespread nature of the problem: more than 20 million Americans are exposed on a regular basis to hazardous noise levels that could result in hearing loss. Of the 28 million people in the United States who suffer from hearing loss, more than one-third of these impairments are at least partially attributable to damage from exposure to loud sounds. We'll hear more about the other findings from our witnesses.

We're going to take a special look this morning at the use of personal stereos because so many of our children have them and play them at levels that are potentially hazardous.

Approximately 21 million personal stereos were sold last year in this country. Most kids don't realize that even listening at half of the full volume may hurt their ears. Virtually every study that has tested the output of personal stereos at the preferred level of listening found those levels to be harmful.

A study undertaken by researchers in Great Britain who wanted to study hearing damage in young people ages 15 to 23 clearly showed the extent of the problem. They reported that they couldn't find enough subjects for a normal-hearing control group. It turns out that most people in that age group have been exposed to loud music and as a result, already have noise induced hearing impairments.

This morning we are going to hear about two recent studies that have not yet been reported in the research literature. One study of adolescents and young adults with noise induced hearing loss found that live or amplified music was the principle source of noise exposure in at least 12% of the patients. In the second study, the maximum output levels of 35 personal stereo devices as well as the comfortable listening levels of a sample of users were tested.

We also will have a demonstration of how loud some common household items can be. We asked for this demonstration because it is important to understand that even noise levels that we take for granted can damage our hearing over a period of time.

Noise induced hearing loss is almost always preventable, but the research also demonstrates that far more education is needed in order for children and teens to learn how to protect their hearing, just as they already learn how to protect their eyes from damage from the sun. I am delighted that we also will hear about innovative and successful education programs.

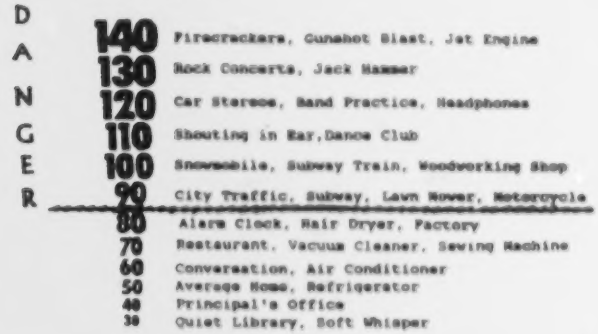
I would like to say for the record that the electronics industry was invited to participate in this morning's hearing, but declined to do so. We hope at a later date that the industry will provide the committee with information on its activities to prevent hearing loss, especially among children.

This morning's hearing will give us a good look at a range of preventive measures that will protect the hearing of our children and teenagers while allowing them to continue to enjoy those leisure activities that are a part of their daily lives. I would like to thank everyone for coming and I look forward to a very stimulating and informative hearing.

TURN IT DOWN: EFFECTS OF NOISE ON HEARING LOSS IN CHILDREN AND YOUTH

FACT SHEET

LOUD NOISES SIGNAL DANGER


DECIBELS (dB)[1]
DANGER
140 Firecrackers, Gunshot Blast, Jet Engine
130 Rock Concerts, Jack Hammer
120 Car Stereos, Band Practice, Headphones
110 Shouting in Ear, Dance Club
100 Snowmobile, Subway Train, Woodworking Shop
90 City Traffic, Subway, Lawn Mower, Motorcycle
80 Alarm Clock, Hair Dryer, Factory
70 Restaurant, Vacuum Cleaner, Sewing Machine
60 Conversation, Air Conditioner
50 Average Home, Refrigerator
40 Principal's Office
30 Quiet Library, Soft Whisper

MILLIONS ARE HEARING IMPAIRED/NOISE RESPONSIBLE FOR LARGE PERCENTAGE

- Over 8% of the U.S. population have a hearing impairment, including 1.6% (1 million) under age 18 and 4.8% for those ages 18-44. Of the 28 million cases of hearing loss in the U.S., over 1/3 (10 million) are partially or fully attributable to noise-induced hearing loss (NIHL). (U.S. Public Health Service, 1989; National Institutes of Health, 1990)

- According to the Annual Survey of Hearing Impaired Children and Youth, 50.1% of hearing impairments among students derived from unknown causes. The remaining proportion derived from known causes, including heredity (13.3%), meningitis (9.0%), infection and fever (4.9%), and prematurity (4.7%). (Gallaudet University, 1990)

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[1]Sound levels above 85 decibels (dB) are potentially hazardous. Decibel increases are logarithmic, so 90 dB is 10 times as loud as 80 dB, and 110 dB is 20 times as loud as 90 dB.

CHILDREN AND TEENS FREQUENTLY EXPOSED TO HAZARDOUS NOISE LEVELS

- A survey of 1500 Ohio high school students found considerable exposure to potentially damaging levels of noise. Respondents reported use of personal stereos with headphones (72%), stereos (96%), dances (71%), rock concerts (43%), tractor pulls (27%), and firearms (30%). (Lewis, 1989)

- According to a university-based study, the following toys emitted hazardous noise levels at close range: toy robots and cars (82-100 dB), toy sirens and drills (74-102 dB), squeaky toys (78-108 dB), and firecrackers (126-156 dB). Additional studies found that many toys held directly to the ear can emit up to 120 dB, and that toy pistols can emit in excess of 150 dB. (Axelsson and Jerson, 1985; Fay, 1989; Clark 1991)

- The average sound level measured at a New Kids on the Block concert was 98 dB (164% of the Occupational Safety and Health Administration allowable dose) and levels routinely rose above 100 dB. Earlier generations of concert amplifiers were in the 20,000 to 30,000 watt range; current large concert speakers are equipped with 100,000 to 500,000 watt amplifiers. (Clark, 1991; Brookhouser, et al., 1991)

- A study of noise exposure among players of electronic arcade games found that normal noise settings ranged from 73 to 111 dB. (Plakke, 1983)

LOUD NOISES CAUSE HEARING LOSS AND OTHER PROBLEMS FOR CHILDREN

- In a study of 94 diagnosed cases of NIHL in children and adolescents, the following causes were identified: fireworks or firearms (46%), live or amplified music (12%), power tools (8%), and recreational vehicles (4%). (Brookhouser, et al., 1991)

- In a Connecticut study of 20 adolescents and 7 adults attending a school dance with amplified music, all but two experienced at least a 5 dB temporary hearing loss and all but one reported tinnitus (ringing of the ears). Of those re-tested three days later, two-thirds demonstrated only partial recovery. (Danenberg, et al., 1987)

- A study examining children attending elementary schools near a busy metropolitan airport found that children from these noisy schools had higher blood pressure, were more likely to fail on a cognitive task, and were more likely to give up on an assigned task than were children from quiet schools. (Cohen, et al., 1980)

- A study of 538 teenage boys found that they were routinely exposed to hazardous sound levels during daily activities; 15% showed hearing loss in high frequencies. (Axelsson, et al., 1981)

- A Wisconsin study found that over half of children actively involved in farm work experienced NIHL, twice the rate of their peers not involved in farm work. (Broste, et al., 1989)

PERSONAL STEREO USE POSES SPECIAL HAZARDS TO YOUNG PEOPLE

- At least 80% of children in a middle class elementary school owned or used personal stereos at least occasionally. Other surveys indicate a range from 37% of school children ages 11-18 in England to 81% of children attending youth clubs in Hong Kong. One study revealed that personal stereo use among young people increased significantly with age -- 9 to 11 years (10%), 13 to 16 years (12%), and 18 to 25 years (35%). (Clark, 1991; Fearn and Hanson, 1984)

- A British study concluded that young people ages 15-23 who regularly use personal stereos and attend concerts suffered hearing loss at twice the rate of young people without such exposure. The study revealed diminished sensitivity to sound and reduced ability to discriminate between pitches. (West and Evans, 1990)

- A study of personal stereo use by teenagers asked participants to listen to music at an enjoyable level for one hour; the mean temporary hearing loss was 9 dB with a maximum up to 35 dB. (Hellstrom and Axelsson, 1988)

- Maximum output levels of 35 personal stereos were found to range from 115 to 126 dB SPL (sound pressure level). When participants listened to personal stereos at a comfortable volume, levels ranged from 83 to 107 dB SPL. A study of 18 personal stereos found that, at one-half volume, the units emitted an average of 104 dB playing rock music and 102 dB playing easy listening music. (Kileny, unpublished; Rintelmann, unpublished)

- In a survey of 89 personal stereo users, 31% reported listening levels which exceeded OSHA risk standards; of this group, half exceeded the Auditory Risk Criteria limit by more than 100%. Another survey of 750 personal stereo users found that one-fifth reported symptoms of tinnitus or dullness of hearing after using their devices. (Catalano and Levin, 1985; Rice, Rossi, and Olina, 1987)

EXERCISE, ALCOHOL, AND SMOKING WORSEN EFFECTS OF NOISE ON HEARING LOSS

- Studies suggest that those who listen to loud music while doing aerobic exercises, which increase blood flow to the extremities, decrease oxygen around the ear, and increase the flow of adrenalin, may be at additional risk of suffering some hearing loss. (Navarro, 1989)

- A 1987 study found that smoking is associated with increased risk of hearing loss in a noise-exposed population. (Barone, et al., 1987)

- Alcohol consumption can increase the amount of noise needed to trigger the acoustic reflex (which protects the ear by reducing sound intensity) by 5-13 dB. (Robinette, et al., 1981)

HEARING LOSS PREVENTION SUCCESSFUL, BUT IN SHORT SUPPLY

- An education hearing conservation program presented to normal hearing elementary school children improved knowledge about NIHL by an average of 23%. A pre-program survey found that only 6% of the children reported use of ear protection; following the program, 97% intended to use ear protection during noisy activities. (Chermak and Peters-McCarthy, 1991)

- Following a high school hearing conservation program in West Virginia, students' correct responses to hearing-related questions improved by nearly one fifth. (Lass, et al., 1986)

- In a survey of Ohio high school students, only 61% of questions regarding hearing loss and protection were answered correctly. In a study of adult hearing health knowledge, participants had correct responses to only 52% of the test items. (Lewis, 1989; Singer and Brownell, 1984)

- In a survey of industrial arts teachers, over half reported that they had no background in hearing conservation. Two-thirds felt that they needed more background in this area. (Plakke, 1985)

Chairwoman SCHROEDER. *Let me yield to the gentleman whose idea this hearing was, the very esteemed gentleman from Illinois, Congressman Durbin.*

Mr. DURBIN. Today, children and young adults will be given an important message. Danger from noise is real, it is irreversible, but thankfully it is preventable. Specifically, we will look at the danger associated with one particular noise source, the personal headset stereo.

As I mentioned to Chairwoman Schroeder before this hearing began, some of my better ideas come about on an airplane. A few years ago, sitting in a smoking section on an airplane, I decided we might take a look at that issue.

Two years ago, I was sitting in an airplane, and there was a gentleman sitting five rows behind me with a headset on, and I could hear it. I thought to myself, what kind of damage is he doing to himself? We ought to look into it.

At the same time, I read some articles and realized some professional people had the jump on me. I realize convincing young adults that loud music from headphones is dangerous and should be avoided is like trying to get the President to eat broccoli or John Sununu to go Greyhound.

Certainly, in conjunction with our education efforts, we must let the manufacturers of noise-makers—not just personal headset stereos, but other products, know they, too, have a responsibility for protecting the hearing of children and other consumers.

For this reason, I am disappointed that representatives from the electronics industry declined our invitation to testify, and are not here today to share the industry's views on the proper use of their products and the industry's efforts to reduce or eliminate any danger associated with them.

Let's face it, deaf and hard-of-hearing Americans are not very good customers for the electronics industry. They should be here working with us.

Let me add, too, there is a Federal statutory responsibility which has been ignored over the last 10 years. The Noise Control Act of 1972 assigned to the EPA the responsibility to promulgate emission standards, product labeling, education and research when it came to noise.

They have been, unfortunately, one of the casualties of the Reagan-Bush era over the last 10 years. That agency virtually does not exist, despite the fact that Congress gave it the statutory responsibility to do important work in this area.

I look forward to hearing from the witnesses who are here on the problems of noise-induced hearing loss, its danger to children, how to prevent it, and specific strategies for reducing the risk of headphone use.

I am certain through education and proper prevention strategies, noise-induced hearing loss from headphone use can be sharply reduced. Thank you.

[Prepared statement of Hon. Richard J. Durbin follows:]

OPENING STATEMENT OF HON. RICHARD J. DURBIN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Today, children and young adults will be given an important message—danger from noise is real, it's irreversible, but thankfully it's preventable.

Specifically, we'll look at the danger associated with one particular noise source—the personal headset stereo.

I realize convincing young adults that loud music from headphones is dangerous and should be avoided is like trying to get John Sununu to go Greyhound. But we can begin to reduce the risk by focusing attention on the problem. And certainly in conjunction with our education efforts, we must let the manufacturers of noise makers know that they too have a responsibility for protecting the hearing of children and other consumers.

For this very reason, I am disappointed that representatives from the electronics industry are not here today to share the industry's views on the danger of their products and the industry's efforts to reduce or eliminate the danger.

But I look forward to hearing from the witnesses who are here on the problems of noise-induced hearing loss, its dangers to children, how to prevent it, and specific strategies for reducing the risks of headphone use.

I am certain that through education and proper prevention strategies noise-induced hearing loss from headphone use can be sharply reduced.

Chairwoman SCHROEDER. Thank you very much.

Did you have an opening statement?

Mr. BARRETT. I would take a moment to congratulate you, Congresswoman Schroeder, for holding this hearing, and to Congressman Durbin for presenting his proposal. I think it is important that we do address the causes of noise-induced hearing loss in children and teenagers.

As I understand it, the number of Americans who are hearing-impaired has increased rather dramatically. Now, I believe it is estimated we have some 10 million Americans suffering some hearing damage due to noise exposure. I know the Walkmans or the personal cassette players are very, very popular.

As a matter of fact, several times when I have gone to talk to my officer manager or my personal secretary, they have had them on. In fact, my whole staff uses them sometimes to drown out the noise in our office. Perhaps that is telling me something, I don't know.

But we are surrounded by noises, every day, whether it is occupational or recreational, everything from vehicles to snowmobiles, farm tractors, and even children's toys. Noise does affect us at all ages, in all aspects of our lives, and we need to recognize the problems and to educate everyone so hearing loss prevention can start at an early age.

We need to stop those statistics from increasing. To help us gain a little better understanding of these issues, I am very pleased to have from my home State, presenting testimony today Patrick Brookhouser.

Dr. Brookhouser is the Conference Panel Chairperson for the National Institutes of Health, and Director of the Boys Town National Research Hospital. I am sure he will tell us something about his research and present his findings and recommendations from the National Institutes' Consensus Development Conference.

Also, I am especially glad to have Dr. James Snow with us. Dr. Snow is the Director of the National Institute on Deafness and Other Communication Disorders at the National Institutes of Health. As some of you know, this Institute plays a very critical role in funding basic and applied research on both the sources of noise-induced hearing loss as well as its impact.

Madam Chair, I feel it is important for everyone to be aware of the effects of continuous loud noise on the environment to prevent a permanent disability, and I again congratulate you for holding the hearing.

Chairwoman SCHROEDER. Thank you very much.

Congressman Wolf, do you have an opening statement? Let us move on to this very distinguished panel.

First of all, we have Dr. James B. Snow, who is the distinguished Director of the National Institute on Deafness and Other Communication Disorders at the NIH in Bethesda, Maryland. We have Paul R. Kileny, who is the Associate Professor and Director of Audiology from the Department of Head and Neck Injury at the University of Michigan School of Medicine, Ann Arbor. We are very, very pleased to have you with us.

And we have Jeffrey Baxter, a musician and record producer from Beverly Hills, California. Jeffrey, we are very pleased to have you with us, too.

Let us begin with Dr. Snow. Dr. Snow, we will put your statement entirely in the record, and the floor is yours to summarize or do whatever you want.

STATEMENT OF JAMES B. SNOW, JR., M.D., DIRECTOR, NATIONAL INSTITUTE ON DEAFNESS AND OTHER COMMUNICATION DISORDERS, NATIONAL INSTITUTES OF HEALTH, BETHESDA, MD

Dr. SNOW. Thank you very much, Madam Chairwoman. I am pleased to have the opportunity to appear before the House Select Committee on Children, Youth, and Families. I bring to you an overview from the National Institute on Deafness and Other Communication Disorders at the National Institutes of Health of a serious threat to the hearing of our Nation's children, youth and adults.

This threat is posed by intense noise in our environment. Dangerous noise is found not only in the workplace, but also at home and during recreation.

Twenty-eight million Americans are hearing-impaired. As many as 10 million of these individuals are believed to have noise-induced hearing loss. Noise-induced hearing loss affects the quality of life of Americans throughout the life span. It results from either sudden and intense noise, like an explosion, or from insidious, prolonged exposure to loud noise at a work site.

Both have the same result—permanent, irreversible hearing loss. Although it affects some 10 million Americans, susceptibility to noise-induced hearing loss varies from individual to individual. The commonality is that noise-induced hearing loss is permanent, and it is also preventable.

The public and our children must be made aware that both the intensity of the sound and the duration of the exposure are factors in noise-induced hearing loss.

The positive message is, noise-induced hearing loss is preventable. Knowledge about effective prevention has resulted from both basic and applied research.

Growing out of a consensus conference recommendation to begin public health education about noise-induced hearing loss with chil-

dren, the NIDCD is producing a campaign entitled, "I Love What I Hear," designed to reach children in the 3rd to 6th grades. The videotape and teacher's guide will introduce these children to the extraordinary biology of hearing, and teach them about noise-induced hearing loss. The materials will give them the strategies to use in self-defense against the noise-induced hearing loss. Our plan includes identifying the school systems that have majority-minority populations, as well as distribution to schools in all 50 States to reach urban, rural and suburban students.

The teenager who is working on his or her car, using a lawn mower or leaf blower, working with a sander or electric saw in shop class, or working at a construction site, is at risk for noise-induced hearing loss.

Dramatic sudden loss of hearing can be the result of being too close to exploding firecrackers. Gunfire is an important cause of hearing loss in adolescents. Exposure to continuous noise, such as that from an internal combustion or gasoline engine or electric motor, can cause injury over time.

Electronically amplified music, lawn mowers, outboard motors, chain saws, tractors, snowmobiles and aircraft are all examples of hazards to the unprotected ear. The NIDCD wants to let families know what they can do to defend themselves from unnecessary hearing loss: one, avoid exposure to dangerous noise. Two, protect children who are too young to walk away from noise by themselves. And, three, in predictably noisy environments, such as working with electric saws, car engines, mowing the lawn, or while discharging firearms, wear ear defenders, special earplugs or muffs, designed to absorb the shock of the noise.

The most important message the NIDCD can bring to you today is that noise-induced hearing loss begins in youth, is irreversible, and most importantly, it is preventable. We must educate our children and youth in the simple techniques of self-defense. We must ask adults to be aware of their own vulnerability, but, as importantly, to set the example of ear defense. Just as parents require infant car seats, seat belts, protective goggles and helmets for their children, parents must teach children to move away from intense noise and make earplugs and earmuffs a part of everyday life. Teenagers and adults must set good examples in ear defense. Noise-induced hearing loss is an issue for children, for youth, and for families. And noise-induced hearing loss is preventable if we work together.

I thank the Chairwoman and the committee for the opportunity to bring attention to this serious and pervasive public health problem, noise-induced hearing loss.

[Prepared statement of James B. Snow, Jr., M.D., follows:]

PREPARED STATEMENT OF JAMES B. SNOW, JR., M.D., DIRECTOR, NATIONAL INSTITUTE ON DEAFNESS AND OTHER COMMUNICATION DISORDERS, NATIONAL INSTITUTES OF HEALTH, BETHESDA, MD

Madam Chairwoman,

I am pleased to have this opportunity to appear before the House Select Committee on Children, Youth and Families. I bring to you an overview from the National Institute on Deafness and Other Communication Disorders (NIDCD) at the National Institutes of Health of a serious threat to the hearing of our nation's children, youth and adults. This threat is posed by intense noise in our environment. Dangerous noise is found not only in the workplace, but also at home and during recreation.

Twenty-eight million Americans are hearing impaired. As many as 10 million of these individuals are believed to suffer from noise-induced hearing loss. Noise-induced hearing loss affects the quality of life for Americans throughout the lifespan. It results from either sudden and intense noise, such as an explosion, or from insidious, prolonged exposure to loud noise on a worksite. Both have the same result---permanent, irreversible hearing loss.

Although it affects some 10 million persons, susceptibility to noise-induced hearing loss varies considerably from individual to individual. The commonality is that noise-induced hearing loss is permanent, and it is also preventable. The public and our children must be made aware that both the intensity of the sound and the duration of exposure are factors in noise-induced hearing loss. The public is not sufficiently

aware of the irreversibility of noise-induced hearing loss nor that noise-induced hearing loss is preventable.

Warning signs of noise-induced hearing loss include diminution of hearing and tinnitus--a ringing in the ears. Usually, tinnitus will disappear two or three months after noise exposure. However, if the symptom persists, the physician should become suspicious that the patient is continuing to be exposed to loud noise. Often the person who experiences a noise-induced hearing loss has become accustomed to the intense noise in his or her environment and does not realize the permanent and irreversible damage being done to the auditory system until it is too late. Many sites in our urban environments subject the passerby to damaging levels of noise. Fortunately, the exposure time is not great enough to cause a measurable loss of hearing, but there is a widely held hypothesis that all exposure to loud noise is additive and contributes to producing the loss of hearing with aging that is known as presbycusis.

The most convincing evidence for this hypothesis is that in some non-industrial cultures individuals reach advanced age with little of no evidence of presbycusis. Such examples would suggest that it is prudent to avoid exposure to loud noise over time. Engendering a spirit of prudence about noise exposure in children and youth is essential.

This means that the public needs a better understanding of the unnecessary economic and social losses that are the result of sudden or insidious destruction of hearing.

The positive message is: Noise-induced hearing loss is preventable. Knowledge

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about effective prevention has resulted from both basic and applied research. Currently the NIDCD is supporting research in the changes in hair cell micromechanics that occur in response to intense sound. It has been demonstrated that the hairs of the hair cells become abnormally flexible after exposure to intense sound. However, this process under intense experimental conditions shows a slight change that is at first reversible. (Saunders, James C.; University of Pennsylvania). A different project is studying the mechanisms resulting in the disappearance of whole hair cells with more intense and prolonged exposure to noise (Bohne, Barbara A., Washington University). The interruption of these processes at the molecular level may be a useful strategy for prevention of noise-induced hearing loss. NIDCD is supporting research in the regeneration of hair cells after exposure to intense sound (Corwin, Jeffrey; University of Virginia in Charlottesville). Regeneration research is directed to finding ways to initiate cell repair to reverse the destruction of noise-induced hearing loss.

The NIDCD is committed to protecting the hearing of our citizens. In October 1988 the NIDCD was created to support biomedical and behavioral research and research training in hearing, balance, smell, taste, voice, speech and language. The Institute is also concerned with disease prevention and health promotion in all of its program areas. In the area of hearing, prevention of noise-induced hearing loss is a primary goal. As one of its earliest initiatives, the NIDCD, in cooperation with the Office of Medical Applications of Research of the NIH, convened a Consensus Development Conference on Noise and Hearing Loss. The Consensus Development Conference brought together biomedical and behavioral scientists, health care professionals , and the public to address acoustic parameters of hazardous noise exposure, the characteristics of noise-induced hearing loss, individual and age-specific

susceptibility, and prevention strategies. A shocking fact is that noise-induced hearing loss can begin between ten and twenty years of age, much earlier than originally thought.

Growing out of the consensus conference recommendation to begin public health education about noise-induced hearing loss with children, the NIDCD is producing a campaign entitled,"I Love What I Hear!," designed to reach children in the 3rd to 6th grades. The videotape and teacher's guide will introduce these children to both the extraordinary biology of hearing and teach them about noise-induced hearing loss. The materials will give these children strategies to use in self-defense against noise-induced hearing loss. Our plan includes identifying both school systems that have "majority minority " population as well as distribution to schools in all fifty states to reach urban, rural and suburban students. The package will be distributed through the National Archives Audio-Visual Center under our current plan as well as being made available through the NIDCD Information Clearinghouse on a loan basis.

The NIDCD has selected this group of children to reach with the noise-induced hearing loss message as they are reaching a level of maturity at which they have some responsibility for their own well-being and are increasingly independent. This period of learning is also at the time of initial risk. These are the young people who help save dolphins; they learn about the environment and work to preserve it. At this age children have an emerging awareness of their ability to have an impact upon their world and upon their own welfare.

We are also anxious to reach young people between ten and twenty years of age with the message of self-protection. They become at risk for noise-induced hearing loss in the pre-teen and teenage years. The teenager who is working on his or her

car, using a lawn mower or leafblower, working with a sander or an electric saw in a shop class or working at a construction site is at risk for noise-induced hearing loss. Dramatic, sudden loss of hearing can be the result of being too close to exploding firecrackers. Gunfire is an important cause of hearing loss in adolescents. Another form of impulse noise that is capable of causing hearing loss is hammering. Exposure to continuous noise such as that from an internal combustion or gasoline engine or electric motor can cause injury over time. Lawn mowers, outboard motors, chain saws, tractors, snowmobiles and aircraft are all examples of hazards to the unprotected ear.

To bring this prevention message to parents, I have participated in two NIH radio programs, disseminated nationwide on "Firecracker Danger" for the 1990 Fourth of July weekend and a holiday message on "Noisy Toys for Girls and Boys" that was a parent guide to safe toy choices to prevent noise-induced hearing loss. I recently taped an interview for Voice of America, a radio service that reaches a potential 150 million people in a variety of languages about noise-induced hearing loss.

As an additional scientific and educational initiative, the NIDCD will co-sponsor a conference with the American Academy of Otolaryngology-Head and Neck Surgery on December 16, 1991 that will examine the affect of pollution, including noise pollution, on the ears. The conference will also examine the affect upon the upper alimentary and respiratory tracts of other kinds of pollution. A monograph from the meeting will be available to the scientific and medical communities. Research findings will be shared in an interactive satellite teleconference scheduled for April 22, 1992--Earth Day. The teleconference will have sponsored downlink sites. The NIDCD is providing a workbook for selected scientists who will host downlink sites by leading sessions on pollution for schools, health care professionals, organizations

concerned with aging, and environmental community groups to support disease prevention and health promotion across the country. The teleconference and a new educational film on pollution will be distributed through the NIDCD 's Information Clearinghouse.

The NIDCD wants to let families know what they can do to defend themselves from unnecessary hearing loss:

- (1) Avoid exposure to dangerous noise;
- (2) Protect children who are too young to walk away from loud noise by themselves. (If the noise is hurting your ears, is making conversation impossible . . . know that the infant in arms is feeling it as intensely) ;
- (3) In predictably noisy environments, working with hammers, electric saws, car engines, mowing the lawn and while discharging firearms--wear ear defenders, special ear plugs or muffs, designed to absorb the shock of the noise.

These are among the messages we will disseminate through the congressionally-mandated and newly-established NIDCD Information Clearinghouse. Examples of materials to be distributed include results of the consensus conference, public education materials, public service announcements and fact sheets. These will be available from the Clearinghouse, as will exhibits to professional and public organizations.

The NIDCD urges young people to protect their hearing by avoiding exposure to loud noise, or by employing ear protectors, specially designed ear plugs or ear

muffs when such noises cannot be avoided. This would include exposure to any electronically-amplified music.

The most important message the NIDCD can bring you today is that noise-induced hearing loss can begin in youth, is irreversible, and most importantly, it is preventable. We must educate our children and youth in simple techniques of self-defense. We must ask adults to be aware of their own vulnerability, but as importantly, to set an example of ear defense. Just as parents require infant car seats, seat belts, protective goggles and helmets for their children, parents must teach children to move away from intense noise and to make ear plugs and ear muffs a part of everyday life. Teenagers and adults must set the example for good ear defense. Noise-induced hearing loss is an issue for children, for youth and for families, and noise-induced hearing loss is preventable if we work together.

I thank the Chairwoman and the Committee for this opportunity to bring attention to this serious and pervasive public health problem, noise-induced hearing loss.

Chairwoman SCHROEDER. Thank you very much, Dr. Snow.

Dr. Kileny, I understand I still pronounced your name wrong. Forgive me for all that. But you are going to come up and show us some noise, right? I don't know how you show noise, but he has found a way. We welcome you and the floor is yours.

I guess you do the demonstration first, right? Can you maybe explain what that is? How about this microphone over here all wired up—see it here. Yeah. Just turn the switch so the red light goes on.

STATEMENT OF PAUL R. KILENY, PH.D., ASSOCIATE PROFESSOR AND DIRECTOR, DIVISION OF AUDIOLOGY AND ELECTROPHYSIOLOGY, DEPARTMENT OF OTOLARYNGOLOGY—HEAD AND NECK SURGERY, UNIVERSITY OF MICHIGAN MEDICAL CENTER, ANN ARBOR, MI

Mr. KILENY. Thank you, Madam Chairwoman.

The instrument I am holding in my hand is a sound level meter. It is commonly used to measure the level of sound of various types of instruments.

Chairwoman SCHROEDER. Would you pull the microphone a little closer? There we go.

Mr. KILENY. This is a sound level meter, an instrument designed to measure intensity or level of sound. The measurement is made in the typical units that I use to measure sound level decibels. There are various scales on this instrument. Typically, environmental noise and industrial noise are measured in the so-called A scale which is weighted to mimic the response of the human ear to environmental sounds.

The device has a microphone, and then it changes the sound measured into an electrical signal that can then be measured on the scale. So I could demonstrate any household item here. Perhaps if we turn on this—this measures a level which is still not regulated in industry, measures about 80 decibels on the A scale. It is certainly annoying, but the sound level of this vacuum cleaner is not considered to be hazardous to hearing at this—at the distance I was standing at.

This measures about the same. It is not atypical—a lot of these household devices powered by electric motors measure between 65, 70 and 85 decibels. Noise control regulation in industry starts at 85—85 or 90 decibels. It depends on which measure we consider.

Perhaps we can turn this on and see what level we can measure here. This was about halfway up the volume scale that we measured here, around 85 dB on the A scale, and this, of course, can produce a lot more intensity than what we have measured here.

With your permission, perhaps, I would like to show a personal stereo device, and I just want to add that the conditions of this measurement are not 100 percent scientific but will give us some idea of what levels we may measure out of these devices. What I am going to be doing here is placing one of the earphones on the coupler, and we measured about 110 decibels here from this one.

Again, we need to allow for some marginal error in this measurement. The measurements I have done are based on actual measurements of the human ear canal.

As you can see, this is holding at the 20 mark on the scale here which reads 90, so we add the 20 to the 90, and it adds up to 110 dB. That is certainly well within the range that is regulated in industry.

Chairwoman SCHROEDER. That is fascinating. Now you are going to tell us a little more about what we have just seen.

Mr. KILENY. With your permission, Madam Chairwoman, I would like to read the testimony that I have prepared for this hearing.

Our acoustic environment consists of numerous types of ever-changing sounds and sound sources. As a rule, if a sound is inherently unpleasant to our ears, we refer to it as "noise." Noise is the type of complex sound we actively try to avoid, regardless of its level, as it interferes with communication and other activities.

By contrast, music is the type of complex sound that many of us actively seek for recreation or intellectual purposes. Music and noise stimulate the inner ear receptors in a similar fashion, and at excessively high levels both can damage and destroy those same receptor elements. We refer to this phenomenon as "noise-induced hearing loss." The term implies, therefore, that only noise, i.e., the unpleasant, unwanted type of sound, is capable of damaging the sense of hearing.

By contrast, if one follows this terminology or reasoning, music may not appear to be associated with this adverse effect. Continued use of this terminology should therefore be considered counterproductive to our efforts to educate children and youth in our society about the adverse consequences of exposure to excessively loud sounds of any type, including music.

A more appropriate term for educating the public regarding these effors may be "acoustically-induced hearing loss," indicating that, regardless of its overall nature, any acoustic signal can damage hearing when presented at excessive levels.

A relatively new addition to sources of acoustic energy is the personal stereo device. Approximately 23 million such devices are sold annually in the United States. When sensibly used, delivery of sound to the ear via headphones is not inherently hazardous to hearing. However, personal stereo devices are potentially damaging to hearing when misused, as their maximum sound outputs are extremely high, approaching the threshold of damage and pain.

Like many large audiology practices, our group at the University of Michigan Medical Center noticed an increase in the incidence of unexplained sensorineural hearing loss among young people. Typically, the audiometric configuration appeared like an acoustically-induced hearing loss in individuals with no history of occupational noise exposure. Their histories, however, included exposure to loud live music and/or habitual use of personal stereo devices.

We proceeded to test the maximum output and listening levels of these devices during a health day at the Medical Center. A total of 35 personal stereo devices were tested. The maximum output levels ranged from 115 to 126 dB SPL.

Listening output levels of personal stereo devices were also tested in the users' ear canals using a probe-tube measurement technique. Comfortable listening levels ranged from 83 to 107 dB SPL.

Clearly, the maximum output levels of personal stereo devices fall within the intensity range regulated by OSHA in industrial settings. For instance, exposure to 100 dB A in an industrial setting is restricted to one hour per day. And yet there may be an untold number of individuals nationwide who listen to personal stereo systems at such a level for several hours per day.

A seldom-mentioned population at increased risk for acoustically-induced hearing loss are those persons with pre-existing sensorineural hearing loss. Because of the high output levels of personal stereo devices, there has been an increase in their use by students enrolled in hearing-impaired programs. Patricia Stuckey, an audiologist with the Detroit Public Schools, has documented both temporary and permanent threshold shifts that appear to be associated with the use of personal stereo devices in three teenaged hearing-impaired students.

Several steps can be taken to reduce the risk of hearing damage that may be associated with personal stereo devices.

One. The Environmental Protection Agency (EPA) should implement provisions for product noise labeling required in part by the Noise Control Act of 1972. Although the Noise Control Act is still in effect, it currently lies dormant and is not being enforced.

Two. Manufacturers of personal stereo devices should be required to include volume-limiting technology in their devices.

Three. Limiting overall output through appropriate technology may not initially be acceptable to manufacturers. Therefore, an alternative to output-limiting is the development of indicator lights (LED), which illuminate when sounds exceed 85 dB SPL.

Four. Nationally-mandated public information programs aimed at school-aged individuals should be established. Such programs should provide information about the hazardous effects of prolonged exposure to loud noise and music. We suggest that the standard terminology of "noise-induced" be changed to "acoustically-induced" hearing loss.

Five. It should be noted that personal stereo devices are not the sole cause of excessive exposure to loud music. Portable radios with loudspeakers (the so-called "boom boxes") and loud car stereos are of equal concern. The positive image associated with excessively loud sound systems should be discouraged.

Thank you very much.

Chairwoman SCHROEDER. Thank you very much.

[Prepared statement of Paul R. Kileny, Ph.D., follows:]

PREPARED STATEMENT OF PAUL R. KILENY, PH.D., ASSOCIATE PROFESSOR AND DIRECTOR, DIVISION OF AUDIOLOGY AND ELECTROPHYSIOLOGY, DEPARTMENT OF OTOLARYNGOLOGY—HEAD AND NECK SURGERY, UNIVERSITY OF MICHIGAN MEDICAL CENTER, ANN ARBOR, MICHIGAN

Our acoustic environment consists of numerous types of ever-changing sounds and sound sources. There are, in fact, few if any instances during a 24-hour period without the presence of some type of acoustic energy. As a rule, if a sound is inherently unpleasant to our ears, we refer to it as "noise". Noise is the type of complex sound we actively try to avoid, regardless of its level, as it interferes with communication and other activities. By contrast, music is the type of complex sound that many of us actively seek for recreation or intellectual purposes. Music and noise stimulate the inner ear receptors in a similar fashion, and at excessively high levels, both can damage and destroy those same receptor elements. We refer to this phenomenon as "noise-induced hearing loss". The term implies, therefore, that only noise, i.e. the unpleasant, unwanted type of sound, is capable of damaging the sense of hearing. By contrast, if one follows this terminology or

reasoning, music may not appear to be associated with this adverse effect. Continued use of this terminology should therefore be considered counterproductive to our efforts to educate children and youth in our society about the adverse consequences of exposure to excessively loud sounds of any type, including music. A more appropriate term for educating the public regarding these efforts may be "acoustically-induced hearing loss", indicating that, regardless of its overall nature, any acoustic signal can damage hearing when presented at excessive levels.

A relatively new addition to sources of acoustic energy is the personal stereo device. This may be a radio, tape player, or a combination, equipped with a set of headphones which replace the loudspeakers commonly found in radios and tape decks. In the past several years, personal stereo devices have become extremely popular and affordable. Approximately 23 million such devices are sold annually in the United States.

When sensibly used, delivery of sound to the ear via headphones is not inherently hazardous to hearing. However, personal stereo devices are potentially damaging to hearing when misused, as their maximum sound outputs are extremely high, approaching the threshold of damage and pain. The highly portable nature of the system often prolongs the abusive listening habits, and subsequently the risk for hearing loss increases. The personal nature of the devices does not provide the user with a frame of reference as to the appropriateness of the volume.

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Concern about the adverse effects of personal stereo systems on hearing dates back to the mid-1970s. Hearing health care professionals, such as otolaryngologists, otologists, and audiologists, became increasingly concerned in the 1980s when a noticeable increase in the use of these devices occurred, especially among teenagers and young adults. Like many large audiology practices, our group at the University of Michigan Medical Center noticed an increase in the incidence of unexplained sensorineural hearing loss among young people. Typically, the audiometric configuration appeared like an acoustically-induced hearing loss in individuals with no history of occupational noise exposure. Their histories, however, included exposure to loud live music and/or habitual use of personal stereo devices. We proceeded to test the maximum output and listening levels of these devices during a health day at the Medical Center. A total of 35 personal stereo devices were tested; the maximum output levels ranged from 115 to 126 dB SPL. While there were no systematic differences between brands, devices equipped with semi-insert type phones generated the highest output levels. Listening output levels of personal stereo devices were also tested in the users' ear canals using a probe-tube measurement technique. This involves the introduction of a small flexible diameter polyethylene tube, which is connected to a microphone and sound level measurement device, into the ear canal to monitor sound levels. The headphone was placed over the user's ear in the usual fashion. Volunteers were asked to set the volume control to their preferred listening

level while sound pressure level in the ear canal was monitored. Comfortable listening levels ranged from 83 to 107 dB SPL. These values do not include brief sound pressure peaks which occasionally exceeded the upper limits of this range. Average listening time ranged from less than one hour per day (primarily reported by individuals using their personal stereos during physical exercise) to six hours per day (typical of older teenagers and college students using their devices during a commute and while studying or reading).

Clearly, the maximum output levels of personal stereo devices fall within the intensity range regulated by OSHA in industrial settings. OSHA regulates maximal daily exposure to levels exceeding 85 dB A and mandates hearing conservation when levels exceed 90 dB A. For instance, exposure to 100 dB A in an industrial setting is restricted to one hour per day. And yet, there may be an untold number of individuals nationwide who listen to personal stereo systems at such a level for several hours per day. Studies dealing with occupational noise exposure have shown that the risk of substantial hearing loss begins to rise sharply at 85 dB A. Acoustically-induced hearing loss takes many years to develop. Additionally, there are large numbers of personal stereo devices in use, all of which are capable of exceeding the sound level outputs regulated by OSHA in industrial settings. These two factors indicate that there appears to be a significant chance for an increase in the hearing-impaired population over the next 10 to 20 years.

The estimation and assessment of hearing loss caused by stereo devices varies. For instance, self-reporting of hearing impairment among teenagers and young adults accurately represents their hearing status. Additionally, the slowly progressing nature of acoustically-induced hearing loss makes identification of such a loss difficult to detect or notice. The measurement of pure-tone thresholds is a more accurate representation of hearing status. However, if, for instance, 3000 Hz is deleted from a hearing screening paradigm, the proportion of affected individuals will be lower. West and Evans (British Journal of Audiology, April 1990; 24(2):89-103) described a sensitive measure of the effects of amplified music in young listeners. These investigators evaluated the frequency resolution of the subjects' auditory perception in addition to audiometric testing using a high-resolution technique. They found that persons who were exposed to loud amplified music demonstrated reduced frequency resolution skills. They also found an increased prevalence of noise-induced hearing loss in their older age group, indicating that loud music has a harmful effect on hearing sensitivity and frequency resolution.

A seldom-mentioned population at increased risk for acoustically-induced hearing loss are those persons with pre-existing sensorineural hearing loss. Because of the high output levels of personal stereo devices, there has been an increase in their use by students enrolled in hearing-impaired programs. Patricia Stuckey, an audiologist with the Detroit Public Schools, has documented both temporary and permanent threshold shifts that

appear to be associated with the use of personal stereo devices in three teenaged hearing-impaired students. One student demonstrated a significant high-frequency threshold shift following a 20-minute listening period at her usual volume. In another case, hearing thresholds were elevated following a two-year period of daily three-hour use of a personal stereo device. Thresholds recovered, however, following a three-month cessation of use. In yet another case, a 17-year-old student with a pre-existing bilateral severe high-frequency sensorineural hearing loss appeared to have lost his residual high-frequency hearing following a two-year period of regular use of a personal stereo device. While discrete listening levels are not available for this group, parents did report that levels were high enough to allow individuals in the environment to hear music radiating from the earphones.

Several steps can be taken to reduce the risk of hearing damage that may be associated with personal stereo devices.

1. The Environmental Protection Agency (EPA) should implement provisions for product noise labeling required in part by the Noise Control Act of 1972. Although the Noise Control Act is still in effect, it currently lies dormant and is not being enforced. These labels would serve to inform the purchaser of the possible harmful effects this equipment may have on the overall acoustic environment and on hearing in particular.

2. Manufacturers of personal stereo devices should be required to include volume-limiting technology in their devices.

Currently, only two manufacturers offer this technology in some of their products.

3. Limiting overall output through appropriate technology may not initially be acceptable to manufacturers. Therefore, an alternative to output-limiting is the development of indicator lights (LED), which illuminate when sounds exceed 85 dB SPL. This technology was previously available on one personal stereo tape device but is not currently available with any personal stereo product.

4. Nationally-mandated public information programs aimed at school-aged individuals should be established. Such programs should provide information about the hazardous effects of prolonged exposure to loud noise and music. We suggest that the standard terminology of "noise-induced" be changed to "acoustically-induced" hearing loss.

5. It should be noted that personal stereo devices are not the sole cause of excessive exposure to loud music. Portable radios with loudspeakers (the so-called "boom boxes") and loud car stereos are of equal concern. The positive image associated with excessively loud sound systems should be discouraged.

In summary, it is our responsibility to make the public aware of the hazardous effects of excessively loud music and noise. We encourage the promotion of healthy listening habits, including appropriate labeling of potentially harmful devices and/or the integration of components to warn listeners of unhealthy listening levels.

Chairwoman SCHROEDER. Now, Jeffrey Baxter, we turn to you. We welcome you this morning and are delighted to have you here.

STATEMENT OF JEFFREY BAXTER, MUSICIAN AND RECORD PRODUCER, BEVERLY HILLS, CA

Mr. BAXTER. I am happy to be here, and I am also happy Jimi Hendrix is—could have something to do with this research. It is nice to hear him.

The technology for the reproduction of speech and music has evolved at an incredible rate since the days of Thomas Edison—from mechanical recording systems and the all-vinyl disc, to analogue electronic reproduction using magnetic tape, to the all digital systems that convert mechanical energy and recorded, compressed, manipulated and reproduced in an infinite variety of ways. Even this advanced technology is being superseded by advances made in the areas of photonics and optical storage.

The reasons behind the development of systems for sound and music recording have changed along with the relentless advance of the technology. At first, virtually all recording was done to preserve a live performance so that the listener could enjoy it at some later date.

With the advent of multi-track recording pioneered by Les Paul in the 1940s, the recording studio became a sonic workshop where recordings were meticulously assembled over a period of time, allowing producers and recording engineers the freedom to record a part of the musical performance on one day, add more instruments the next day, add the vocal the day after and finally assemble, or "mix," all the pieces at a time and place of their choice. All the while the technology allowing for more information to be recorded, manipulated and reproduced with better quality, advanced at an exponential rate.

The electronics of sound reproduction advanced from the vacuum tube to the transistor, from analogue to digital, from monaural to stereo to quadraphonic, to surround-sound systems that can create sonic virtual reality.

Loudspeaker systems and headphones became more and more advanced in their ability to reproduce sound more efficiently and at greater levels of loudness and purity, as well as at frequencies above and below the range of human hearing. The power and effect of this sophistication is such that, as we speak, its military aspects and weapons applications are being explored in laboratories around the world.

All this has been magnified by the transition from acoustic to electronic instruments, sound amplification and its integration into live performance. This technology has also proved to be extremely beneficial in some extraordinary ways.

We are all familiar with hearing aids for the hearing-impaired and electronic voice-boxes for those people who have damaged vocal chords. But you may not be familiar with a piece of modern day technology known as the cochlear implant, a device developed and utilized by people such as Dr. John House and his colleagues at the House Ear Institute in Los Angeles, California.

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When surgically implanted into the head of a deaf child or adult, it can restore some auditory sensation where there was none before. You have only to see the look on a formerly totally deaf child's face after the operation to see what a miracle this technology can create. I have gone in with an acoustic guitar after one of these operations and played, and it is incredible.

I have spent the time presenting you with some background on audio reproduction to reinforce the point that technology, in and of itself, is neither beneficial nor harmful. It is in its application. This is where education and awareness become the important factors.

We must teach our children and young people about the auditory sense. We teach them about vision. We tell them not to look at the sun or they will damage their eyes. For those that are not convinced, a quick glance at reflected sunlight or other high-intensity light source combined with the instant pain and temporary loss of vision that results will usually do the trick.

By the same token, we do not outlaw welding and power tools. We teach those that use them to wear a certain kind of eye protection. The impact of a baseball bat moving at high speed into the nasal cartilage and its bloody and painful result gives both visual and sensory credence to the fact that this is not a good thing.

We allow the existence of baseball bats, but we teach our kids how to play baseball. Because hearing is less understood and the loss and injury to this sense usually manifests itself in a much more subtle and long-term manner, people pay much less attention to its preservation. We live in an age where technology develops exponentially, but our human knowledge and awareness develops arithmetically.

As I learned when I was growing up, the word "no" was one of the greatest motivational factors in getting me to do the opposite.

I am the 1990–1991 spokesman for the Hearing is Priceless, (HIP), campaign for the House Ear Institute, and I have had occasion to speak to large groups of students and young people. One of the questions most frequently put to me is to explain why I have worn and still wear headphones during live performances.

I reply by telling them that I live in a nice house, drive a nice car and enjoy some of the finer things that life has to offer, and I owe it all to music. But, to my knowledge, the only successful deaf musician that I am aware of was Ludwig von Beethoven. The headphones that I have been wearing for 15 years completely isolate my hearing from unpredictable sound levels on stage and allow me to hear what I need to at a level that is safe and comfortable for me.

Also, who knows what incredible forms of personal enjoyment the audio technologies of the future may take and why deprive yourself of any possibility to fully enjoy them? So then they say to themselves, "Well, this guy is over 40 years old, but he is on MTV!

To sum up, we need to learn as much as we can about the subject of hearing, how it can be damaged and how it can be protected through situational awareness, the use of ear protection and common sense and pass this knowledge on to our youth.

We live in a world of jet engines, motorcycles, jackhammers and numerous other creations of modern life as well as the marriage of electronics and music. We teach our kids to keep their hands off

the hot stove and to look both ways before crossing the street. Let's do the same with their hearing.

Chairwoman SCHROEDER. That is wonderful. I am glad to hear—I think noise has the same effect on everyone.

[Prepared statement of Jeffrey Baxter follows:]

PREPARED STATEMENT OF JEFFERY BAXTER, MUSICIAN AND RECORD PRODUCER, BEVERLY HILLS, CA

The technology for the reproduction of speech and music has evolved at an incredible rate since the days of Thomas Edison; from mechanical recording systems such as the wax cylinder, the laquer coated disk and the all-vinyl disc, to analogue electronic reproduction using magnetic tape, to the all digital systems that convert mechanical energy and analogue information into computer data that can be recorded, compressed, manipulated, and reproduced in an infinate variety of ways. Even this advanced technology is being superceded by advances made in the areas of photonics and optical storage.

The reasons behind the developement of systems for sound and music recording have changed along with the relentless advance of the technology. At first, virtually all recording was done to preserve a live performance so that the listener could enjoy it at some later date. With the advent of multi-track recording, pioneered by Les Paul in the 1940's, the recording studio became a sonic workshop where recordings were meticulously assembled over a period of time, allowing producers and recording engineers the freedom to record a part of a musical performance on one day, add more instruments the next day, add the vocal the day after and finally assemble, or "mix", all the pieces at a time and place of their choice. All the while, the technology allowing for more information to be recorded, manipulated, and reproduced with better quality, advanced at an exponental rate. The electronics of sound reproduction advanced from the vacuum tube to the transistor, from analogue to digital, from monoraul to stereo to quadraphonic, to surround-sound systems that can create sonic virtual reality. Loudspeaker systems and headphones became more and more advanced in their ability to reproduce sound more efficiently and at greater levels of loudness and purity, as well as at frequencies above and below the range of human hearing; (the power and effect of this sophistication is such that, as we speak, it's military aspects and weapons applications are being explored in laboratories around the world.) All this has been magnified

by the transition from accoustic to electronic instruments, sound amplification and it's integration into live performance. This technology has also proved to be extremely beneficial in some extraordinary ways. We are all familiar with hearing aids for the hearing-impared and electronic voice-boxes for those people who have damaged vocal chords. But you may not be familiar a piece of modern -day technology known as the cochlear implant, a device developed and utilized by people such as Dr. John House and his colleagues at the House Ear Institute in Los Angeles, California. When surgically implanted into the head of a deaf child or adult, it can restore some auditory sensation where there was none before. You have only to see the look on a formerly totaly deaf child's face after the operation to see what a miracle this technology can create.

I have spent the time presenting you with some background on audio reproduction to re-enforce the point that technology, in and of itself, is neither beneficial nor harmful. It is in it's application. This is where education and awareness become the important factors. We must teach our children and young people about the auditory sense. We teach them about vision. We tell them not to look at the sun or they will damage their eyes. For those that are not convinced, a quick glance at reflected sunlight or other high-intensity light source combined with the instant pain and temporary loss of vision that results will usually do the trick. By the same token, we do not outlaw welding and power tools, we teach those that use them to wear a certain kind of eye protection. The impact of a baseball bat moving at high speed onto the nasal cartilage and it's bloody and painful result gives both visual and sensory creedence to the fact that this is not a good thing. We allow the existance of baesball bats, but we teach our kids HOW to play baseball. Because hearing is less understood and the loss and injury to this sense usually manefests itself in a much more subtle and long-term manner, people pay much less attention to it's preservation. We live in an age where technology developes exponentially but our human knowledge and awareness developes arithmetically.

As I learned when I was growing up, the word "no" was one of the greates motivational factors in getting me to do the opposite. I am the 1990-1991 spokesman for the Hearing is Pricless, (HIP), campaign for the House Ear Institute, and I have had occasion to speak to large groups

of students and young people. One of the questions most frequently put to me is to explain why I have worn and still wear headphones during live performances. I reply by telling them that I live in a nice house, drive a nice car and enjoy some of the finer things that life has to offer and I owe it all to music. But, to my knowledge, the only succesfull deaf musician that I am aware of was Ludwig von Beethoven. The headphones I have been wearing for fifteen years completely isolate my hearing from unpredictable sound levels on stage and allow me to hear what I need to at a level that is safe and comfortable for me. Also, who knows what incredible forms of personal enjoyment the audio technologies of the future may take and why deprive yourself of any possibililiy to fully enjoy them? So then they say to themselves,"Well, this guy is over 40 years old, but he IS on MTV! HMMMM!"

To sum up, we need to learn as much as we can about the subject of hearing, how it can be damaged and how it can be protected through situational awareness, the use of ear protection, and common sense and pass this knowledge on to our youth. We live in a world of jet engines, motorcycles, jackhammers and numerous other creations of modern life as well as the marriage of electronics and music. We teach our kids to keep their hands off the hot stove and to look both ways before crossing the street. Let's do the same with their hearing.

Chairwoman SCHROEDER. Let me first yield to Congressman Durbin since this was really his idea and you have brought us a great panel. Go for it.

Mr. DURBIN. Thank you very much, Chairwoman Schroeder.

Mr. Baxter, I don't believe we have let everyone know about your total musical background and history. I don't know all the details, but I know at one point you did play as a guitarist with the Doobie Brothers, and you said Jimi Hendrix was your friend. So I think we are almost contemporaries.

Last year I was invited to a Rolling Stones concert at RFK Stadium. Big crowd. I took these phone earplugs and used them, and it was still too loud. My friends who didn't use these earplugs and who were with me had their ears ringing for a day or two afterwards.

How long can a rock musician go on in this environment and still be productive, not using ear protection the way you have over the course of your career?

Mr. BAXTER. It is interesting—like I say, I am over 40 years old. As you get older you begin to have a sense of responsibility about what you do. I think it is something that all of us have, and I have musician friends—a fellow from a band called The Who, Peter Townsend, who will actively tell children and people who will listen to him that he has lost a lot of his hearing because of rock and roll. Not the music itself but because of the high audio level.

There were times—when I started there was nobody in school to tell me or no one to educate me to the fact that I was hurting myself. Luckily, I had been wearing headphones for a totally different reason. I found when I would get off the stage my ears weren't ringing, and I didn't have to yell.

There are musicians—the bass player for The Who is very explicit about the fact he has hurt his hearing. I think it is a question of educating the educators to educate the educators. It is a situation that needs to be addressed, and I think we are the people in the music industry to begin to do that.

Mr. DURBIN. For a person who is a musician or appreciates music, the only analogy I can think of is color blindness. If you are color blind you can visit an art museum, but you miss a lot. People who have lost their hearing are missing so much. They hear something, but they are missing a lot in the process.

It seems to me a musician who wants to develop his craft and skill would have to protect those talents and his hearing.

Let me ask you, Dr. Kileny, is that correct?

Mr. KILENY. That is correct.

Mr. DURBIN. What kind of decibel output are we talking about at these rock concerts?

Mr. KILENY. It depends how far you are from the bank of loudspeakers. Even at a fair distance the level can exceed 120 dB. Certainly when you are very close and when you are on stage you are exposed to the full magnitude of the sound and 120, 125 dB are not unusual levels developed at these rock concerts. These are, in fact, beyond levels permissible at all in industrial settings.

Mr. DURBIN. You used that reference a couple of times. I take it from what you said that 110 dB for an hour is considered to be dangerous or harmful to a person?

Mr. KILENY. That is correct.

Mr. DURBIN. It sounds like moving from 110, to 120, to 125 is not that substantial, but as I understand it, each decibel increment of five is logarithmic—can you explain that?

Mr. KILENY. The decibel scale is a nonlinear scale. So, in fact, every five decibels is roughly a doubling of the energy.

Mr. DURBIN. If 110 is dangerous to you and you are at 115 it is twice as dangerous as 110?

Mr. KILENY. That is correct.

Mr. DURBIN. You are saying at a rock concert it can go up to 125?

Mr. KILENY. Yes.

Mr. DURBIN. Is that four or five times as dangerous as what we said is dangerous loss of hearing level for an individual?

Mr. KILENY. That is correct. An industrial regulations compromise was actually made from a three dB increment to five dB increment, and there are various kinds of discussions whether it is appropriate or not, but this is a very conservative—the 5dB rule in industry which means that with every additional five dB one needs to halve the time of the exposure is by many considerations a very conservative measure. No such measure exists outside industrial settings.

Mr. DURBIN. I take it from the device you use to measure your decibels, of course, the proximity to the sound is a critical factor. If we turn this boom box at the other end of the Mall at the Washington Monument and stand at this end we are perfectly safe. As we draw closer to it the danger increases. We can certainly see with headsets and headphones you have personalized and identified the distance between the sound and your actual eardrum or whatever it is that stands to run the risk of being endangered.

With other devices, though, it is somewhat uncertain, is it not, as to how far the person is going to be from the actual appliance or boom box when it is being operated, and that is an important factor, is it not?

Mr. KILENY. That is an important factor. I think we need to take into consideration the typical distance or relation to the sound source, to a typical sound source. For instance, if you use a vacuum cleaner you have to be reasonably closer because you are manipulating it.

If you use one of these stereo radios with loudspeakers, a so-called boom box, of course, you could be at the other end of the room, but the habit I have seen is that people listen to these in extremely close proximity, carrying them on a shoulder or sitting very close to it. And at that distance these devices are built to develop loud sound in a rather large room.

The personal stereo devices are calibrated in such a way as to achieve the same effect but in a very small volume, which is the ear canal. Your example of the gentleman listening to a personal stereo device on an airplane is a very good one. Because these headphones are not made to develop enough sound pressure for us to be able to actually identify the piece of music in a room of this size and certainly not in an airplane and the fact that you could actually detect and recognize what was playing indicates the level was excessively high.

Mr. DURBIN. What about these boom cars—I probably have the wrong name here. You can go to any city in America and stand out on Main Street and watch what is happening with people rolling their window down. Some have dedicated the entire automobile to a sound system.

Mr. KILENY. The output from these systems is actually higher than the portable stereo, the radio we have here to a personal stereo device. These devices are built in such a way that they can output in excess of 125 decibels within the car. If you have ever stood at a red light next to one of these cars or just have happened to pass one at a fair distance on a sidewalk, you can appreciate the level. In fact——

Mr. DURBIN. Appreciate was not the word I was looking for. You are saying it is four times as dangerous as the threshold danger level we have identified for hearing if it is at 125?

Mr. KILENY. Approximately. You have to measure these. The promotion for these sound equipment vehicles is typified by so-called sound-offs that the industry sponsors. In fact, the "better systems" are the ones that provide the highest level of output.

Mr. DURBIN. I am going to leave it to my colleagues here to ask follow-up questions of you. I appreciate the fact you made specific suggestions which I am going to take a look at in terms of possible legislation.

I would like to ask Dr. Snow a question if I could.

Dr. Snow, you seem to be at the medical end of this discussion, and the important Federal research into hearing loss and reasons for it. I mentioned in my opening statement that we, in the Noise Control and Abatement Act of 1972, assigned to the EPA—I am sure there are assignments to other agencies—the responsibility to promulgate certain industry standards, education standards, labeling standards, and have not funded that agency.

For all intents and purposes, I am told that agency has a statutory responsibility and no funding over the last 10 years. Have you noted this and what impact has this had on the medical research which you have been able to develop?

Dr. SNOW. What you say is correct. The Office of Noise Control and Abatement in the EPA was closed in 1982 and has not been reopened as far as I know.

This has not had any particular influence on research into noise-induced hearing loss. That has gone forward, supported in large part by the National Institute on Deafness and Other Communication Disorders, but it certainly has had an effect upon the enforcement of the regulations regarding labeling of devices as to their decibel output.

Mr. DURBIN. I can tell you—if I understand it, there are only four devices that this agency set a standard for in the course of its existence, and they are, I am sure, very important, but they show we have just scratched the surface when it comes to areas that should be regulated—air compressors, motorcycles, trucks, and waste compactors. They have really only opened the door a little bit in terms of what we can get into here.

I think the Administration and Congress have been remiss in not following through on this. We can identify air and water pollution

and health dangers associated with it. Certainly, noise pollution brings the same.

Mr. Baxter, if I can return for my closing question, I have seen the group you are working with is visiting high schools and speaking to young people across America. I guess, as my kids have told me—they are getting a little older now—as my kids have told me, lay off a little bit here. You tell us not to use drugs, you tell us not to drink, you tell us to be careful here, there, and the other place, and now you are telling us to wear earplugs to concerts.

Tell me, if you can, what kind of reaction you are getting from young people when this is just another old geezer coming up with an order that they found totally irrelevant to their lives.

Mr. BAXTER. First, I would like to comment on the car stereo, the boom cars. I went to a panel discussion at the Consumer Electronics Show this year, and some of the major manufacturing companies who sponsor these contests actually have changed the criteria from loudness and, again, to quality. They really are trying, because I think a lot of people realize there were some oversights in the past, and they are trying to change it.

But you are asking me, how do you tell a child or a young person that doesn't want to listen, to listen? I think there are a couple of ways of doing it.

The way I approach it, I don't wag my finger, you want to blow your ears out? Go right ahead; that is fine with me. I am not thrilled with it, but if that is what you want to do, go ahead. Take a second to realize that what you are going to miss, the fact, one of these days, you are going to be able to plug into the cerebral cortex of your brain and enjoy technologies we don't even know about. Why do you want to hurt yourself?

Also, you talk about drinking, as well. It is—finally guys are beginning to understand it is not cool to throw up on your girlfriend, and that does—it took several generations to reach this level. That is true. The amount of research that has gone into this is incredible. The same idea it is not cool to have your girlfriend say, huh, what, what did you say?

I hesitate to use the word "cool," but we are talking about what is cool, and I certainly did some silly things when I was a kid. I probably still do silly things now. I did those because I didn't care; I felt I was immortal. And I did them, also, because I didn't know any better.

The idea of someone like myself who is in the business and who does make records and who does, obviously, want people to be able to hear what I do, coming from me and coming from my peers, it seems to work a little bit.

At first, they are a little—the kids in the high school are a little bit combative, but it is amazing how afterwards, when they are not around their friends, they sneak up and say, tell me a little more about this. Do you have any of those earplugs?

The kids at Hollywood High that we spoke to were very receptive to it—maybe because Hollywood is the entertainment capital of the world.

It has to come from a friendly point of view. You can't wag your finger.

Mr. DURBIN. Thank you.

Chairwoman SCHROEDER. Thank you very much. Congressman Wolf, do you have any questions?

Mr. WOLF. I thank you very much. I want to thank the panel.

I have a couple of questions. One, why do you think most young people turn the volume up loud? What is the basic reason?

Mr. BAXTER. I think music is a sensory experience. It is a physiological and psychological experience. The psychology of music is well known by people like myself who write movie sound tracks and try to create visual images with the music.

It is a physical experience because the feeling of music striking your body is very—I hesitate to use the word "sensual" because it connotes sexual, but it is a sensual experience because your body feels it. I think because people want to become immersed in the music of their favorite artist, they want to become a part of that performance, the loudness level has become sort of a way to do that.

Mr. WOLF. Is the problem worse today than it was, say, 20 years ago? I would imagine the answer would be yes. If there were a panel like this holding hearings in 1970 or even 1960, would the problem today be worse?

Dr. SNOW. The problem is very grave. In the United States at the present time when we look at noise-induced hearing loss and the major causes of that in youngsters, in individuals who are 10 to 20 years of age, are exposure to small arms fire, recreational shooting, hunting and target practice, and exposure to mechanized equipment, particularly farm equipment.

Mr. WOLF. Is the problem with regard to young people worse now today with regard to industrial or with regard to the entertainment area? In 1960, you know, there weren't any Walkmans around.

Dr. SNOW. Yes. Even though there are such devices today, the vast majority of all cases of noise-induced hearing loss are due to exposures to small arms fire and to mechanized equipment, although exposure to electronically amplified music is an important danger and should be avoided.

Mr. WOLF. What sources of noise should we be more concerned with? Where do you think the problem lies?

Dr. SNOW. No question, small arms fire and mechanized equipment, the sort of things that I mentioned. Gasoline engines, electric saws, chain saws, tractors. These are the things that really take the hearing of our young people. Numerically far more important than amplified music.

Mr. WOLF. You sensitized me. This weekend I used a lawn mower and a tractor, a very loud, old one. After that I cleaned it with a blower to blow the gas away. I never thought to put these earplugs on. I am going to take these earplugs home.

I understand these earmuffs are not the same kind that are worn in the winter to protect your ears from the cold.

Dr. SNOW. These are fluid-filled muffs, generally filled with glycerine, so they accommodate the side of the head and the ear and make a very good occlusion to exclude the noise.

Mr. WOLF. Where are they purchased from?

Dr. SNOW. From any sporting goods store. The earplugs can be purchased from any drug store and are less expensive. The attenu-

ation, the protection from the loud noise, is approximately equivalent with the two. So it is much less expensive to protect the hearing with earplugs.

Mr. WOLF. The NRA and the different firearm courses that are given deal with safety of firearms. Do they deal with the hearing loss question?

Dr. SNOW. I am afraid I don't know the answer to that. Perhaps we could obtain information on that for the record.

[The information follows:]

According to information provided by the National Rifle Association of America (NRA), they address hearing loss prevention in the following manner: safe, responsible firearms use, including proper hearing loss prevention techniques, are taught by NRA-certified instructors; the wearing of protective devices for the eyes and ears while shooting at ranges is considered a standard; baseline audiograms and periodic updates for competitors and others who shoot frequently are encouraged; and hearing loss prevention is stressed through NRA publications and periodicals.

Mr. WOLF. I forget from when I was in the military, but I don't think we used earplugs. Do you know if the military uses earplugs?

Dr. SNOW. At the present time there is a hearing conservation program in all of the armed services that is very effective. Indeed, if you see the films of the Desert Storm combat, you will see that our troops had ear defenders on. I was very impressed with the regularity with which ear defenders were being worn.

Mr. WOLF. Ear defenders, how do you define that? Is that an earplug?

Dr. SNOW. Earplug or an earmuff. For example, in the artillery scenes, they always had earmuffs on.

Mr. WOLF. That is good.

One last question. How does the sound level mechanism work, Dr. Kileny, with regard to the light indicator? Let's say you had a mechanism on the Walkman or on the boom box. Does it come on like a green light comes on when you hit the acceptable level? Is there another light that lights up when you go above the acceptable level? Is there a danger level indicator? How does that work?

Mr. KILENY. There could be a number of versions. The basis of this is a means to actually, if we are talking about a device that uses a headset, it is a means to actually measure the sound level, in this case probably with a small microphone built into the earphone system. This would be a level detector. You would probably have a system where upon reaching a certain level, and as I have suggested, perhaps 85 dB, a light would come on.

It would still allow the user the freedom of either leaving or turning it farther up. But it would provide information that you have now reached a level beyond which we do not consider this to be safe.

There was one such device on the market which was manufactured. It did have an indicator light. As far as I know, it is no longer manufactured. Clearly, the technology exists to have this safeguard built into these devices.

Mr. WOLF. How would you do that? Mr. Durbin was talking about the distance away from a speaker. Would that be effective in a boom box?

Mr. KILENY. No.

Mr. WOLF. Would it only be effective in a Walkman that is directly on the ear?

Mr. KILENY. That is right. It could be used in loud speakers, but it would not be as effective because of the variance in the listening distance and the variance in the type of environment relative to reverberation, presence or absence of reverberation which could further enhance the sound and so forth and so on. It could be effective and easy to implement in a device that used a headphone.

Mr. WOLF. I guess you could also say you could have a standard for a stereo, say, in a room 10 by 10 this level would be recommended, and then another level in a room 20 by 20. I guess there could be ranges whereby for boom boxes or things like that, safety recommendations would be in the instructions. People may not read them, but it would be there.

Would that be possible? Or does that get too complicated, because of the size of the speaker, size of the room and things like that? Is it very complicated or is it relatively easy to do?

Mr. KILENY. I believe it would be more complicated because the typical buyer purchases various components from various manufacturers, and loud speakers as well as tuners have their own power output rating. And one always attempts to match the power output. It becomes a little bit more difficult to do that than in something that is fully integrated.

Mr. WOLF. Thank you all. You certainly sensitized me to this issue. I am going to take these earplugs home and use them next weekend when I cut the grass.

Chairwoman SCHROEDER. Thank you.

Congressman Barrett?

Mr. BARRETT. No questions at this time. Thank you.

Chairwoman SCHROEDER. I want to thank the panel, too. It is a little frustrating because if we passed the Noise Control Act in 1972 and shut the whole thing down in 1982, and the problem has only gotten worse, I guess it says we are not paying too much attention.

When you look at, like, this toy box and it says on the side, "Volume limiter avoids excessive sound level," that is not really a Federal standard. You could put that on whether or not it did, is that right? There is no one looking at that?

Dr. SNOW. Right. Many manufacturers voluntarily place the output on their product.

Chairwoman SCHROEDER. Is there any group looking at what the manufacturers are doing? Is there like a manufacturing group or something that puts standards out? Do we have any idea what this standard really means?

Dr. SNOW. Not that I know of. But I think that we ought to address that issue for the record to make certain that we are providing you correct information.

[The information follows:]

According to the Government Standards Division of the National Association of Manufacturers, Washington, D.C., its responsibility is as a lobbying group for manufacturers. The Division suggested contacting the Electronics Industries Association (EIA), Washington, D.C., for volume standards. The Consumer Division of EIA stated that volume levels are limited only by efficiency of the product; there are only recommendations and warnings, not standards, with regard to volume levels.

Chairwoman SCHROEDER. It could mean that parents won't go nuts because it is not that noisy. There is this thing about noisy toys that kids really love.

Dr. SNOW. Yes. Our institute made a public service announcement prior to the last holidays to warn parents about noisy toys for girls and boys.

Another important consideration is that there is a widely held theory that the exposure to loud noise, although it may not be enough to produce noise-induced hearing loss, is cumulative over the years, and may contribute to the development of presbycusis, the hearing loss of aging. One line of support for this is that in non-industrial societies, individuals live to advanced age with virtually no evidence of presbycusis.

It is simply prudent to avoid all exposure to loud noise.

Chairwoman SCHROEDER. I think that is very important. That kind of goes to what Mr. Baxter was talking about, as we sit here talking about in middle age, you start looking at all those things and realizing the parts don't last forever.

The other thing that I have heard, and I don't know that it is true, maybe one of our medical people could say, I heard that drinking could make the impact of loud noise worse.

Dr. SNOW. Yes. I will say that there is conflicting information in the literature about that. Maybe Mr. Kileny would like to comment on it.

Mr. KILENY. There is some. And I concur with you, Dr. Snow, that the information in the literature is conflicting. It is possible, and there is one scenario by which the protective mechanism of the ear from loud sound exposure is partially impaired or made less efficient because of the effects of alcohol.

There are pros and cons for this, for this view. So I guess the jury is still out.

I think some of the attempts that were made to study this issue address the problem that typically one would go to a club where one would combine drinking with listening to loud music. That may enhance to some extent the risk.

Chairwoman SCHROEDER. Why have we not done more research in this area? Has it just been a lack of interest? I mean, Dr. Snow, how do you feel about this compared with the work of other institutes or other things we focused on?

Dr. SNOW. A great deal of research has been done on noise-induced hearing loss. It has been a principal focus for research over the last 50 years. A great deal is known about noise-induced hearing loss. We know precisely slightly how to prevent it.

On the other hand, there are still important questions that we would like to know about noise-induced hearing loss. So there is a great deal of additional research that should be carried out.

The importance of concomitant factors, you mentioned alcohol, but also various drugs, smoking. There are many considerations of that type that need further investigation. We need to know more about the molecular biology of noise-induced hearing loss so we can try to develop strategies of interrupting the process in its development.

Of course, we need to develop strategies for restoring hearing once a loss of hearing has occurred. We are very interested in

studying the regeneration of the hair cells in the inner ear that are destroyed in noise-induced hearing loss. There are many opportunities for additional research in noise-induced hearing loss.

Chairwoman SCHROEDER. You said there is a tremendous amount we do know. It seems to me we haven't done a good job in getting through the noise and clutter of our civilization to get that information out to the average person. I think it is important that Jeffrey Baxter is visiting young people and I think what your Institute does is important. Somehow it doesn't reach me.

You said you made the announcement at Christmastime. I somehow didn't hear it. It kind of got lost in all the other noise and clutter and has not focused through.

Congressman Durbin said he had a follow-up question.

Mr. DURBIN. I wanted to ask Dr. Snow and Dr. Kileny. Dr. Kileny has been kind enough to make specific suggestions of things we might consider in terms of regulation and legislation.

Is it unreasonable when we talk of things other than the headset stereos, we are talking about chain saws, for example, to suggest that they require, that they sell with them these earplugs as a very visible reminder to people that they should be used during the operation of this equipment? These are pretty cheap, aren't they?

Dr. SNOW. They are very inexpensive. That is a splendid suggestion.

Mr. DURBIN. It strikes me it would be hard to miss the suggestion it is important to use these as part of the operation.

Dr. Snow, if I could follow through with something Congresswoman Schroeder asked earlier. When I told my wife what this hearing was about, I said, I wonder about—and maybe Mr. Baxter, you might address this, too. I wonder as you look down the line at people growing up in my generation, Mr. Baxter's generation, that have been through the experience of rock concerts, I wonder if we are talking about a generation of Americans who will need help with hearing aid devices. My wife said, maybe it is a good idea to buy stock now when you look ahead as to how many people will be using these down the line.

Is there a real concern that we are going to have so many millions of Americans with hearing loss that we are going to see more and more needing devices to help them enhance or amplify hearing?

Dr. SNOW. The number of individuals with hearing loss will increase in the future as the population ages. One third of people over 65 years of age would benefit from a hearing aid. As that population over 65 grows, as it is predicted to do, there will be a greater need for hearing aids in the future.

Mr. DURBIN. I am noticing some people under the age of 65 who are using devices to help with their hearing. Is that becoming more common, too?

Dr. SNOW. Yes. I think that the use of hearing aids is becoming more common. Many more individuals are utilizing aids than at any time in the past.

Mr. DURBIN. Thank you very much.

Chairwoman SCHROEDER. Do you have something to add?

Mr. BAXTER. We have to make people understand that hearing isn't magic. I think that the sense of hearing is taken as some sort

of unknown, voodoo kind of something that nobody understands and therefore isn't really dealt with.

There has been a certain amount of research that if you are exercising that set levels of volume levels through headphones or any other source will affect you more as more blood goes to that part of the ear, to the cochlea, to the parts of the ear that have to do with hearing.

I think all things should be addressed with hearing in mind, just as we talk about lights and welding and flashes and sunlight. All things that have to do with the eyes are dealt with on that level.

I think that on chain saws, I think the suggestion of putting a small package of earplugs with a chain saw, with an exercise cycle, with a boom box, at rock concerts, everything that has to do with hearing, if it is all addressed as hearing and not taken as one particular thing over another, if you look at your sense of hearing as something to be protected over all, I think the idea of adding earplugs, that is a great idea. It just has to be done over everything.

Chairwoman SCHROEDER. When your ears ring for a long period of time, that does mean you did something to them?

Dr. SNOW. That is right. That is a warning signal that damage is being done.

When you experience ringing in the ears, you know that you have exceeded the safety level of noise exposure; you should avoid that source of sound again without using earplugs.

Chairwoman SCHROEDER. Thank you all again very, very much. You are a very distinguished panel.

You have really added an awful lot to our information and positive suggestions, too.

Let me call up the second panel, which we are very happy to have with us.

First we have Dr. Patrick Brookhouser, the Director of Boys Town National Research Hospital at the School of Medicine at Omaha, Nebraska, at the Creighton University.

Then we have William W. Clark, a Senior Research Scientist at the Central Institute for the Deaf at St. Louis, Missouri. We have Howard E. Stone, the CEO and Executive Director of Self Help for Hard of Hearing People, known as SHHH, in Bethesda, Maryland. He is accompanied by Stephanie House, who is the Staff Coordinator.

We are very pleased to have them here, too.

We will start with each of you.

We will put all your statements in the record; you are then free to summarize or do whatever you like.

STATEMENT OF PATRICK E. BROOKHOUSER, M.D., CONFERENCE AND PANEL CHAIRPERSON, NATIONAL INSTITUTES OF HEALTH CONSENSUS DEVELOPMENT CONFERENCE ON NOISE AND HEARING LOSS; DIRECTOR, BOYS TOWN NATIONAL RESEARCH HOSPITAL OMAHA, NE; FATHER FLANAGAN PROFESSOR AND CHAIRMAN, DEPARTMENT OF OTOLARYNGOLOGY AND HUMAN COMMUNICATION, CREIGHTON UNIVERSITY SCHOOL OF MEDICINE, OMAHA, NE

Dr. BROOKHOUSER. Thank you.

I would like to specifically acknowledge Congressman Frank Wolf, ranking Minority Member of the committee, and Congressman Bill Barrett, a Member of the committee from my home state of Nebraska.

By way of introduction, I serve in several capacities which are relevant to the topic of today's hearing. First, I serve as Director of the Boys Town National Research Hospital in Omaha, Nebraska, which specializes in clinical and research programs concerned with childhood hearing and speech disorders.

I am also Father Flanagan Professor and Chairman of the Department of Otolaryngology and Human Communication at the Creighton University School of Medicine.

Finally, I was privileged to serve as the Conference and Panel Chairperson of the NIH Consensus Development Conference on Noise and Hearing Loss held in Bethesda, Maryland, in January 1990.

Before commenting specifically on the effects of noise and hearing loss in children and youth, I would like to make some introductory remarks about normal human auditory function.

The human ear has truly remarkable capabilities. It can detect sounds as soft as the purr of a kitten, and can withstand, at least for a short time, very loud sounds such as the wail of an air raid siren or the roar of a jet engine. The normal range of audible frequencies extends from 20 cycles per second (Hz), lower in pitch than the lowest note on a piano, to at least 16,000 to 20,000 Hz, well above the highest note on a piccolo.

Besides detecting danger signals, such as smoke alarms and car horns, and allowing us to enjoy the beauty of a Mozart Symphony, hearing is a critical component in the complex communicative exchanges which characterize modern life, at school, in the home or in the work place.

The loss of some or all of one's ability to hear can significantly limit access to an array of educational, vocational and cultural experiences and opportunities. We talked about the types of hearing loss that can be caused by noise.

I would like to highlight a few things. Most of what we talked about so far fall into the range of continuous noises; that is music or the hum of an engine, which many times sound very loud to you at the time the damage is being done, although most people are unaware of that until they're out of the situation.

The impact noise caused by things like gun fire or a firecracker happens so fast and is so loud that you can lose hearing without having any idea you have been exposed to a loud sound.

As we began to look at this problem, it became evident that the multiplicity of devices now available in leisure time activity area outside the work place where regulations apply have become so profuse that people are unaware of them. People are putting themselves at risk without realizing it.

This is particularly true among young children and adolescents. It is particularly true on the farm, in the rural environment.

We know for a fact that many of the chores boys and girls are asked to do as part of being a contributing member of a farm family put them at risk for hearing loss, and the regulations do not apply to the rural environment.

In a recent paper on noise-induced hearing loss in children drawn from our experience at Boys Town National Research Hospital, we reported the results of a study of 114 children and adolescents (ages 19 and younger) who were diagnosed as having noise-induced hearing loss on the basis of history and audiometric configuration. We found children as young as 14 months who sustained hearing loss.

One child had been in a car when a firecracker was thrown in. There were children exposed to loud music, usually in the 10 or older group, but there were younger children exposed to noisy devices such as motorcycles, snowmobiles, assisting a parent in a home workshop or accompanying a parent to the rifle range or on a hunting trip.

Seventeen percent of the kids upon whom we had serial audiometric testing, that is multiple tests, showed progression of their hearing loss.

I would like to show you audiograms so you get a feel for this.

We talked about the decibel scale being an exponential scale. This shows a child we saw first at age 10 years and four months who was brought in for a problem with a learning disability.

They did a hearing test and the hearing was normal. At 13 years and five months, the child was brought back and showed this degree of hearing loss. The only intervening history we had was exposure to power tools. This is a permanent hearing loss.

This shows what can happen with hunting and motorcycles. This was a child we saw early; he had perfectly normal hearing.

At 15 years, 11 months, he had experienced this type of permanent hearing loss. I doubt if, in this situation, the child was aware it was happening.

Next slide.

We talked about rock music. This is a boy that was playing in a rock band. He came in saying from time to time, "I notice my hearing is muffled. It has become a little worse over the last couple of years." Again, he was unaware of the kind of damage he was having.

How pervasive is this among the adolescent population? The next chart will show that. One way to figure this out pragmatically is to look at what the military allows on the way in.

They set their standards so they can get adequate numbers of recruits, depending on what they are able to get.

This shows what allowable induction standards look like. To get adequate numbers of people into the military, into the volunteer Army, they had to relax inductions standards to allow these kind of losses on the way in. It has implications for communicative performance in noisy situations.

The higher frequencies which many times are not screened for in school testing are very important in the transmission of speech.

The higher pitched consonants that allow us to separate words one from another are not well picked up by people like that. A child is put in a classroom, which in many ways may not be a good acoustical environment; they have difficulty with these kinds of losses, yet many school programs don't test in that range.

We are looking at a problem that is pervasive enough that I think it should be addressed legislatively and regulatorily at the

Federal and state level. There are Federal regulations in place, which could have something to do with it.

I think music is one thing to focus on, but there are many devices in the home and around the farm of which people are unaware that are causing their problems.

So I would be very much in favor of a much elevated level of public education. I think it needs to begin very early, much before school.

It should begin in well-baby visits, kindergarten roundups. As the children move through various training in school, such as music training, training on how to operate home saws, shop training, if they go through a health curriculum, all of those ought to stress this as an important health problem.

I have often said the irony of watching a young child ride on a motorcycle with a helmet on or a child riding in a boom car without ear protection ignores one major area of risk which most of us aren't aware of.

Many teenagers view themselves as basically immortal and not susceptible to this. We also know many teenagers today are parents.

Before they know what the problems are, they are exposing their younger children to the problem.

Thank you again for inviting me.

[Prepared statement of Patrick E. Brookhouser, M.D., follows:]

PREPARED STATEMENT OF PATRICK E. BROOKHOUSER, M.D., CONFERENCE AND PANEL CHAIRPERSON, NATIONAL INSTITUTES OF HEALTH CONSENSUS DEVELOPMENT CONFERENCE ON NOISE AND HEARING LOSS; DIRECTOR, BOYS TOWN NATIONAL RESEARCH HOSPITAL, OMAHA, NE; FATHER FLANAGAN PROFESSOR AND CHAIRMAN, DEPARTMENT OF OTOLARYNGOLOGY AND HUMAN COMMUNICATION, CREIGHTON UNIVERSITY SCHOOL OF MEDICINE, OMAHA, NE

Madam Chairwoman and members of the Committee, thank you for inviting me to appear before you today. I would also like to specifically acknowledge Congressman Frank Wolf, ranking Minority member of the Committee, and Congressman Bill Barrett, a member of the Committee from my home state of Nebraska. By way of introduction, I serve in several capacities which are relevant to the topic of today's hearing. First, I serve as Director of the Boys Town National Research Hospital in Omaha, Nebraska, which specializes in clinical and research programs concerned with childhood hearing and speech disorders. I am also Father Flanagan Professor and Chairman of the Department of Otolaryngology and Human Communication at the Creighton University School of Medicine. Finally, I was privileged to serve as the Conference and Panel Chairperson for the NIH Consensus Development Conference on Noise and Hearing Loss held in Bethesda, Maryland, in January 1990.

Before commenting specifically on the effects of noise and hearing loss in children and youth, I would like to make some introductory remarks about normal human auditory function. The human ear has truly remarkable capabilities. It can detect sounds as soft as the purr of a kitten and can withstand, at least for a short time, very loud sounds such as the wail of a siren or the roar of a jet engine. The normal range of audible frequencies extends from 20 cycles per second (Hz), lower in pitch than the lowest note on a piano, to at least 16,000 to 20,000 Hz, well above the highest note on a piccolo. Besides detecting danger signals, such as smoke alarms and car horns, and allowing us to enjoy the beauty of a Mozart Symphony, hearing is a critical component in the complex communicative exchanges which characterize modern life, at school, in the home or in the workplace. The loss of some or all of one's ability to hear can significantly limit access to an array of educational, vocational and cultural experiences and opportunities.

The best available estimates indicate that 28 million Americans have some degree of hearing impairment. Sometimes hearing loss is caused by a genetic defect or birth injury. In other cases it results from serious infections like meningitis. Unfor-

tunately, at least 10,000,000 of the 28,000,000 hearing losses which affect our fellow citizens are partially, if not totally, attributable to damage from exposure to loud sounds. Hearing impairment associated with noise exposure can occur at any age, including early infancy, and is often accompanied by the troublesome symptom of tinnitus (i.e. ear noises). Because noise-induced hearing loss results from irreversible damage to sensitive inner ear structures, it is not amenable to any current medical or surgical treatment. An important consequence of the pattern of hearing loss most commonly caused by noise is difficulty in understanding speech sounds, which could impair performance in the classroom and on the job.

More than 20 million Americans, including children and adolescents, are exposed on a regular basis to hazardous sound levels which could result in hearing loss. The deleterious effect to the ear of repeated sound overstimulation is cumulative over time and gradually becomes permanent. Utilizing currently available knowledge about how to protect our ears from damage, noise-induced hearing loss is entirely preventable, except for the occasional case of accidental exposure. The phenomenon of noise-induced hearing loss has been appreciated for more than one hundred years, but most interest has been directed toward hazardous noise in the occupational environment. The National Institutes of Health Consensus Statement on Noise and Hearing Loss also considered the problem of noise hazards present in the home and associated with leisure time activities. Particular attention was directed by the Consensus Panel to potential risks for noise-induced hearing loss among children and adolescents. The proliferation of potentially harmful noise sources in the home, on the farm, and in our recreational environments has placed increasing numbers of unsuspecting individuals, including children and adolescents, at risk, but appropriate public education efforts about hearing protection have been sporadic and largely ineffective. Widespread and consistent use of appropriate ear protection devices by individuals at risk has been an elusive goal. As a potentially preventable permanent disability, noise-induced hearing loss in children and adolescents should be accorded high priority on the nation's public health agenda.

In a recent paper on noise-induced hearing loss in children drawn from our experience at Boys Town National Research Hospital, we reported the results of a study of 114 children and adolescents (ages 19 and younger) who were diagnosed as having noise-induced hearing loss on the basis of history and audiometric configuration. In 42 children the loss was unilateral while bilateral losses were present in 72. The gender distribution of our sample was consistent with the findings of other investigators, in that 90.3% of the affected children were males. The mean age of referral for evaluation was 12.7 yrs. (range 1.2 to 19.8 yrs., S.D. 4.21 yrs.) but 26% of these losses were diagnosed in children aged 10 years or younger. Parents or guardians were asked to identify the potentially damaging noise sources to which their child was exposed. Among 70 children for whom very reliable information was available, fireworks or firearms were identified as the sole noise source in 21 of 58 (36%) children with bilateral losses and 8 of 12 (67%) of youngsters with unilateral losses. Histories of 14 of 19 children (74%) with exposure to multiple noise sources also mentioned fireworks or firearms. Consequently, noise exposure histories on 43 of 94 children (46%) included exposure to impulse sounds produced by fireworks or firearms. Although cap pistols and noisy toys have been identified in the literature as possible hazardous noise sources, none of the histories mentioned either. Such an omission may reflect a lack of caregiver awareness of the noise levels produced by such devices. Live or amplified music was identified in 11 of 94 (12%) cases as the principal source of noise exposure.

The age of identification of the hearing loss in relation to the type of noise source implicated in the history was also examined. Although the "loud music" category contained only youth aged 10 years or greater, all other categories included youngsters in the preschool and early elementary age groups. The noise exposure histories were replete with descriptions of children riding with a parent on a recreational vehicle (e.g. motorcycle, snowmobile), assisting a parent in a home workshop, or accompanying a parent on a hunting trip or a visit to a target range. Eight of 47 children (17%) for whom serial audiometric test data was available showed progression of their hearing loss, including involvement of additional frequencies in some cases, over a mean follow-up period of 2 yrs. 1 mo.

Based on the results of this study and the findings of the National Consensus Development Conference on Noise and Hearing Loss, I submit that the problem of noise-induced hearing loss in children and adolescents merits urgent attention from both a clinical and public health viewpoint. That children as young as 14 mos. of age are sustaining irreversible noise damage to their auditory acuity is an alarming finding. Older youngsters who accompany parents on snowmobiles and motorcycles, or ride in "boom" cars without ear protection are clearly at risk for noise-induced

hearing loss. Wearing a child-size motorcycle helmet or sitting in a safety seat in a "boom" car does not address an important health risk, namely noise.

The preponderance of males to females in the study is impressive and reiterates findings of previous investigators. It has been postulated that the average male child or adolescent is more likely to engage in leisure time activities involving potentially hazardous noise exposure. The macho image often portrayed by film and television actors firing weapons at close range to others does little to stress the importance of avoiding noise exposure. A parent should not be surprised when a young child, who watches television or goes to the movies, fires a cap pistol or throws a firecracker close to another youngster's ear.

Current military induction standards for acceptable hearing levels in potential recruits provide persuasive evidence that greater numbers of adolescents are presenting for preinduction hearing tests with high frequency hearing losses. Permissible audiometric configurations can vary from a deep high frequency notch to a sharp slope, with hearing loss of up to 45 dB at 3000 Hz. and 55 dB at 4000 Hz, with no induction standards even specified for 6000 or 8000 Hz. The communicative performance of individuals with this degree of hearing loss in conditions of background noise, as experienced in military operations, could be seriously degraded.

The growing number of household and leisure time devices capable of generating potentially damaging noise raises anew the issue of consumer product labeling as an important facet of noise-induced hearing loss prevention programs. Labeling of toys and other products designed for use by young children could help acquaint parents with potential risks to their children's hearing. Enforcement of existing federal laws regarding hazardous noise by the Consumer Protection Agency could also raise public awareness and stimulate voluntary efforts by manufacturers and consumers. Educational programs for children and parents regarding hazardous noise must begin in early life, perhaps during well baby visits, and continue through elementary and high school. Children must be acquainted with early symptoms of noise-induced hearing loss, particularly temporary threshold shift and tinnitus. Youth growing up in rural environments deserve special attention because their assigned chores, as well as leisure activity on the farm, may involve exposure to hazardous noise at an early age.

The need for follow-up otologic and audiologic evaluations for affected children and adolescents should be stressed because of a definite risk of further noise-induced hearing loss in this age group. Often, such children and their parents are told that the loss involves frequencies above the primary speech frequencies of 500, 1000 and 2000 Hz. and that speech discrimination in the quiet test booth is good. Recent data regarding the prevalence of school problems among children with unilateral hearing loss and so-called "minimal" losses reinforces the impression that no hearing loss is really trivial.

Hearing health providers and public health officials should cooperate to lead community efforts aimed at implementing effective hearing conservation programs focused on the school-age population. Well baby visits, kindergarten round-up, school health/science curricula, music instruction, automotive repair training, woodworking courses, vocational agricultural programs and firearm safety classes all present opportunities to instruct young people and their parents about hazardous noise. Scouting and other leisure time programs should redouble their educational efforts, as well. The public education efforts of Sertoma International, a public service organization, which have provided printed and videotape information about how to prevent noise-induced hearing loss to more than four million school children across the U.S., deserve special commendation.

As a potentially preventable public health problem with significant educational and social implications, noise-induced hearing loss should receive additional legislative and regulatory attention at the local, state, and federal levels. Well planned and implemented hearing conservation programs, with particular emphasis on avoiding exposure to potentially damaging noise, could reduce the societal burden of irreversible hearing loss in the United States more than all other interventions combined.

Chairwoman SCHROEDER. Dr. Brookhouser, would you have copies of those charts we could put in the record?

Dr. BROOKHOUSER. Yes.

[The information follows:]

Figure 5

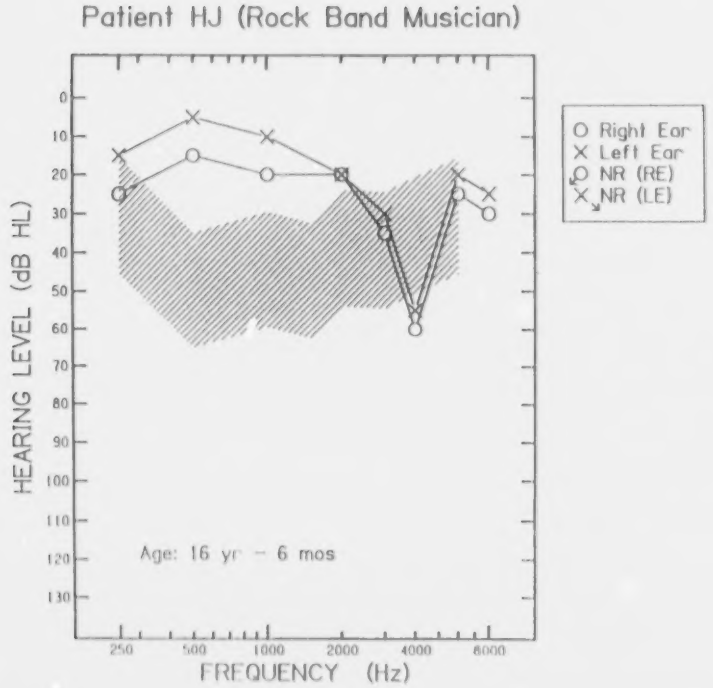

Patient HJ (Rock Band Musician)
HEARING LEVEL (dB HL)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
250
500
1000
2000
4000
8000
FREQUENCY (Hz)
Age: 16 yr - 6 mos
O Right Ear
X Left Ear
O NR (RE)
X NR (LE)

Figure 6

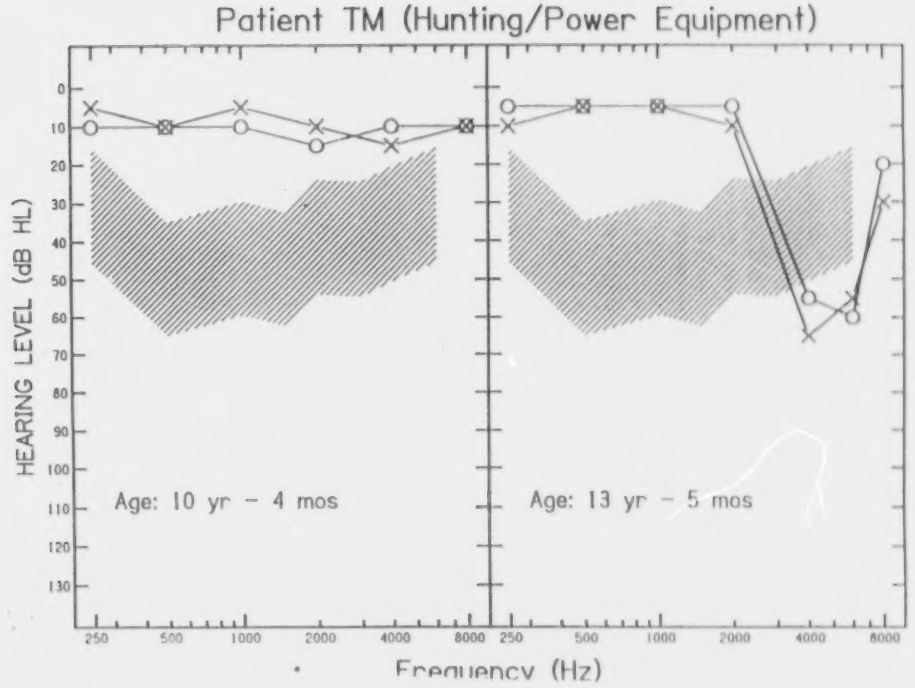

Patient TM (Hunting/Power Equipment)
HEARING LEVEL (dB HL)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Age: 10 yr - 4 mos
Age: 13 yr - 5 mos
250
500
1000
2000
4000
8000
Frequency (Hz)

Figure 8

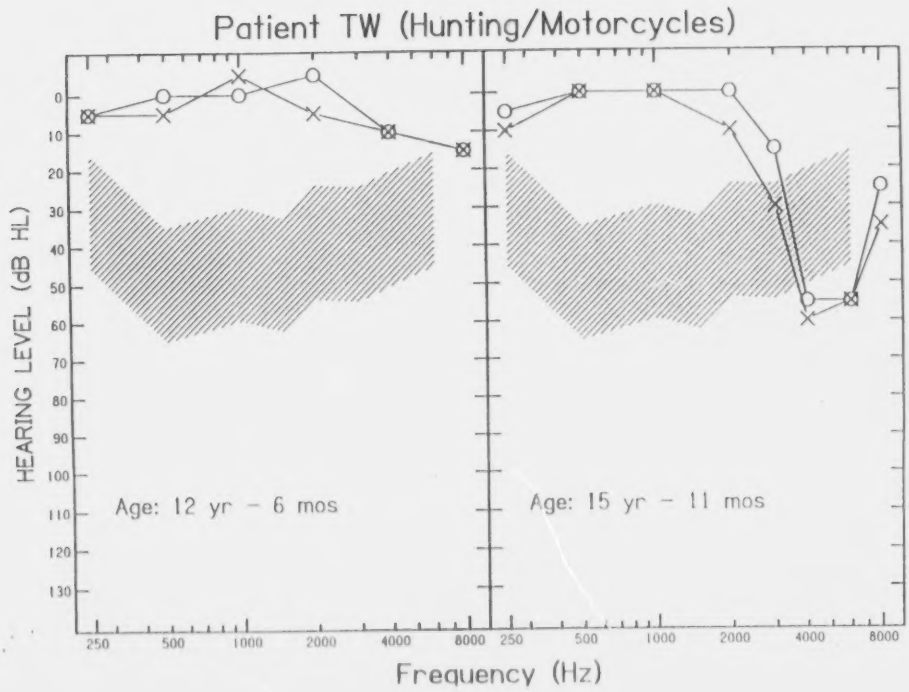
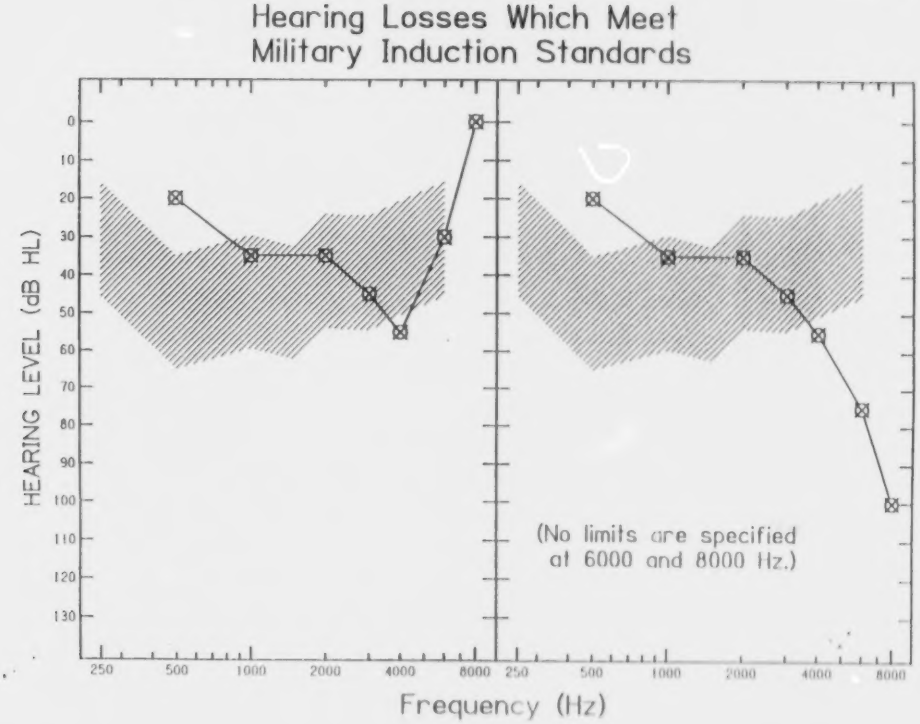

Patient TW (Hunting/Motorcycles)
HEARING LEVEL (dB HL)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Age: 12 yr - 6 mos
Age: 15 yr - 11 mos
250
500
1000
2000
4000
8000
Frequency (Hz)

Figure 9



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61

62

STATEMENT OF WILLIAM W. CLARK, PH.D., SENIOR RESEARCH SCIENTIST, CENTRAL INSTITUTE FOR THE DEAF, ST. LOUIS, MO

Mr. CLARK. My name is William W. Clark, and I am a senior research scientist at the Central Institute for the Deaf in St. Louis, Missouri.

Since 1914 Central Institute, a private, nonprofit oral school has educated thousands of profoundly deaf children, helping them to acquire speech and lip-reading skills which allow them to communicate with the hearing community and to lead productive normal lives.

I come to you this morning not to discuss deafness, but hearing—the hearing sensitivity of our Nation's 64 million children and youths who have begun their lives with normal hearing and now must preserve it through a lifetime of insults from occupational and environmental noise. And I come to you with a concern.

Twenty-five percent of Americans aged 65 and older have hearing impairment severe enough to interfere with the quality of life. Although some of this loss is caused by the aging process itself and is called "presbycusis," recent studies of hearing in humans who live in low-noise environments and in animals raised in quiet have shown that a lifetime of environmental noise contributes significantly to the hearing problems of America's older generation.

Unlike the aging process itself, which is unavoidable, hearing loss caused by excessive noise exposure can be prevented—by understanding the sources of hazardous noise, by avoiding or limiting them, and by wearing effective hearing protection during noisy activities.

My testimony is limited to the potential hazards of hearing associated with prolonged listening to amplified music over headphones of personal stereo systems, such as the popular "Walkman" from the Sony Corporation.

I do not consider other hazards which may be associated with the use of these devices, such as accidents caused by the failure to hear warning signals.

The question of whether listening to music through headphones may cause hearing loss depends upon, among other things, the volume level selected by the listener, the amount of time spent listening, the pattern of listening behavior, the susceptibility of the individual's ear to noise damage, and other noisy activities which will contribute to the individual's lifetime dose of noise.

By studying the behavior of groups of individuals, it is possible to make general statements about risks to a population.

In the past two decades several reports have been published which assessed hazards associated with listening through personal stereo systems. Some of these studies reported only the maximum sound levels attainable by the devices and pronounced them hazardous on the basis of a comparison of Federal workplace noise standards.

Although there are technical reasons that these comparisons are invalid, it is clear that most personal stereos are capable of producing sound levels in the ear in excess of 100 dB Sound Pressure Level (SPL), and some may range as high as 128 dBSPL. Typically, personal stereo output in decibels varies from about 60 at the

lowest volume setting to 105–114 at the highest volume setting, even in inexpensive units.

The first Sony you displayed this morning has an output limiting switch which reduces the level to a safe 85 decibels by the operation of a screwdriver control switch. However, my five-year old daughter has learned to put the screwdriver in and adjust that upward so she can listen to New Kids on the Block at the level pleasing to her rather than a level pleasing to me.

More pertinent to the issue, however, are questions abut how many children and youths use devices, how often, and for how long, and how loud do they play them when they use them.

Informal surveys I have conducted in elementary schools indicated at least 80 percent of the children in a middle-class elementary school owned or used personal stereos at least occasionally. These statistics are in line with other surveys which range from 37 percent of school children in England to 81 percent of children attending youth clubs in Hong Kong.

Studies of listening habits have generally found a wide range of listening behaviors and preferred volume settings among individual listeners. Because hearing hazard is associated with both the intensity and the duration of noise exposure, it is necessary to consider both factors together in determining the risk of hearing loss.

Utilizing this approach, several studies have suggested that although the majority of listeners selected listening levels lower than 90 decibels, 5–10 percent of those who regularly listened to stereos were doing so at dangerous levels and for durations long enough to present a hazard, and up to 20 percent experienced symptoms such as a sensation of fullness or ringing in the ears after exposure which are indicative of a temporary noise-induced hearing loss.

In summary, it is clear that personal stereos are capable of producing hazardous sound levels to the ear, which, if used at maximum levels for prolonged periods pose a risk of causing noise-induced hearing loss. A number of studies which evaluated preferred listening levels and frequency of use indicate that concern is warranted for only those few listeners who prefer listening at maximum levels for extended periods of time. It should be kept in mind that these risk assessments consider only headphone exposures; no consideration is given to the other noise exposures these children may receive which will contribute to the risk of eventually developing a hearing loss.

It is recommended that manufacturers of all personal stereo units provide a warning on the unit which describes the symptoms of hearing loss (fullness in the ear or sensation of ringing) and cautions against exposures which produce those symptoms.

In addition, a volume control logo painted red for volume settings which exceed the free-field equivalent level of 90 dBA combined with appropriate information in the operator's manual would be helpful.

Finally, in my opinion the most effective tool is to educate children about the importance of protecting their hearing not just from personal stereos, but from all types of excessive noise which pervades our environment.

I believe that effective hearing health education for elementary and secondary school children, if practiced for a lifetime, will lead

to a significant reduction in the number of our older Americans who suffer from hearing loss in future generations.

Thank you.

[Prepared statement of William W. Clark, Ph.D., follows:]

PREPARED STATEMENT OF WILLIAM W. CLARK, PH.D., SENIOR RESEARCH SCIENTIST, CENTRAL INSTITUTE FOR THE DEAF, ST. LOUIS, MO

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significantly to the hearing problems of America's older generation. Unlike the aging process itself, which is unavoidable, hearing loss caused by excessive noise exposure can be prevented- by understanding the sources of hazardous noise, by avoiding or limiting them, and by wearing effective hearing protection during noisy activities.

My testimony is limited to the potential hazards to hearing associated with prolonged listening to amplified music over headphones of personal stereo systems, such as the popular "Walkman" from the Sony Corporation. I do not consider other hazards which may be associated with the use of these devices, such as accidents caused by the failure to hear warning signals.

The question of whether listening to music through headphones may cause hearing loss depends upon, among other things, the volume level selected by the listener, the amount of time spent listening, the pattern of listening behavior, the susceptibility of the individual's ear to noise damage, and other noisy activities which will contribute to the individual's lifetime dose of noise. By studying the behavior of groups of individuals, it is possible to make general statements about risks to a population.

In the past two decades several reports[4-15] have been published which assessed hazards associated with listening through personal stereo systems. Some of these studies reported only the maximum sound levels attainable by the devices and pronounced them hazardous on the basis of a comparison of federal workplace noise standards. Although there are technical reasons that these comparisons are invalid, it is clear that most personal stereos are

capable of producing sound levels in the ear in excess of 100 dB Sound Pressure Level (SPL), and some may range as high as 128 dB SPL. Typically, personal stereo output in decibels varies from about 60 at the lowest volume setting to 105-114 at the highest volume setting, even in inexpensive units.

More pertinent to the issue, however, are questions about how many children and youths use these devices, how often, and for how long, and how loud do they play them when they use them. Informal surveys I have conducted in elementary schools indicated at least 80% of children in a middle class elementary school owned or used personal stereos at least occasionally. These statistics are in line with other surveys which range from 37% of school children 11-18 years old in England[14] to 81% of children attending youth clubs in Hong Kong[15].

Studies of listening habits have generally found a wide range of listening behaviors and preferred volume settings among individual listeners. Because hearing hazard is associated with both the intensity and the duration of noise exposure, it is necessary to consider both factors together in determining the risk of hearing loss. Utilizing this approach, several studies have suggested that although the majority of listeners selected listening levels lower than 90 decibels, 5-10% of those who regularly listened to stereos were doing so at dangerous levels and for durations long enough to present a hazard, and up to 20% experienced symptoms such as a sensation of fullness or ringing in the ears after exposure which are indicative of a temporary noise-induced hearing loss.

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It is recommended that manufacturers of all personal stereo units provide a warning on the unit which describes the symptoms of hearing loss (fullness in the ear or tinnitus) and cautions against exposures which produce those symptoms. In addition, a volume control logo painted red for volume settings which exceed the free-field equivalent level of 90 dBA combined with appropriate information in the operators manual would be useful.

Finally, in my opinion the most effective tool is to educate children about the importance of protecting their hearing not just from personal stereos, but from all types of excessive noise which pervades our environment. I believe that effective hearing health education for elementary and secondary school children if practiced for a lifetime, will lead to a significant reduction in the number of our older Americans who suffer from presbycusis in future generations. Thank you.

References

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Summaries of studies listed above but not included in direct testimony:

Increased use of personal stereos and cassettes (Sony Walkman-type radios), particularly in youths and children, has led to general concern about potentially hazardous exposures. Informal surveys by the author in elementary school classrooms has indicated that 80-90 percent of 4th-6th grade students own and use personal listening devices. Media attention, concern by parents, and most likely potential product liability have led some manufactures to include warnings in the instruction manual which caution against prolonged listening at high volume levels. In general, the quality of studies in the literature which address hazards of exposure from personal stereos (PSSs) is variable. A summary of the findings of several studies is presented in Table I. Early reports by Wood and Lipscomb (1972), and Katz et al., (1982) considered only the maximum levels attainable from personal hi-fi headphones; no attempt was made to

determine "typical" levels or to assess frequency or duration of exposure. Wood and Lipscomb reported SPLs as high as 124 dBA from earphones and Katz reported maxima of 110-128 dBA. Based solely on the observation that maximum levels exceeded the OSHA 90 dB criterion for an 8-hr workday, both papers concluded that earphone listening represented a hazard to hearing.

More relevant than the maximum levels attainable is some estimation of the levels actually set by listeners. Kuras and Findlay (1972) asked self-described rock music fans ages 18-25 to judge preferred listening levels and uncomfortable levels for "Whole Lotta Love", by Led Zeppelin, and for a tape of the listener's choice. All subjects reported listening behavior of at least 30 minutes, 4 or more times per week. Listeners reported a mean MCL for the set piece of 92.7 dBA and 88.1 dBA for the choice piece; of the 75 choices made, only 10 exceeded 100 dBA, and only two approached the 122 dBA figure reported by Wood and Lipscomb. The authors concluded that it is questionable whether any signifiicant noise-induced hearing loss would result from exposures to rock music at the preferred levels for the majority of listeners unless the exposures continued for several hours daily over several years.

In Appendix II of the their review, Davis et al. (1985) reported the results of a study of preferred ear-canal SPLs for PSSs in young listeners (21-22 years old) under two conditions: when music listening is a background activity for some other activity; and when the music is the main item of interest. Listeners who used music as a background selected levels which averaged 74.2 dB SPL (s.d.= 7.06); when music was the main activity the average level was 83.3 dB SPL (s.d.= 9.31). Eliminating classical music from the reportoire raised the average level to 85.3 dB

SPL. Only one listener out of 22 selected a level which exceeded 100 dB SPL.

Catalano and Levin (1985) administered a questionnaire concerning preferred volume settings and weekly exposure in hours for PSSs in 154 college students in New York City. Sound levels for each volume setting for 3 popular PSS models were determined on an artificial ear, and a calculation of daily noise dose was obtained and compared to OSHA standards. It was reported that the three cassette players produced levels ranging from 60 dBA at volume setting "1" to 110-114 dBA at volume setting "10". Using the OSHA 90 dBA TWA as a standard, it was found that 29.2% of the females and 41.2% of the males exceeded 100% of the permissible exposure level; 10.1% of the subjects had TWAs of 100 dBA or greater (400% dose). It was concluded that PSSs present a hazard to hearing for a substantial proportion of young listeners.

Lee, Senders, Gantz, and Otto (1985) asked sixteen volunteers who regularly used PSSs to listen to "rock" or "fusion" music for a period of three hours at their "preferred maximum level". Audiograms were obtained for each subject before and after the listening sessions. Headphone output in dB SPL, measured on an artificial ear with a NBS 9A coupler, varied from 90-104 dB SPL. Nine subjects experienced no significant TTS; the average output of the headphones was 92 dB SPL in this group. Six additional subjects had TTSs of 10 dB at one or more frequency; the average headphone output in this group was 99 dB SPL. One subject, with a headphone output of 104 dB SPL, sustained a 35 dB TTS in the right ear at 4 kHz.

Rice, Breslin and Roper (1987) described a technique to express listening levels of PSSs in terms of the free-field

equivalent continuous A-weighted sound pressure levels by applying a transfer function to the levels obtained on an acoustic manniken. Expressed this way, the levels could be compared to damage risk criteria which are based upon free-field measures of sound level. A survey of more than 60 users who regularly listened to music and speech indicated a mean listening level of 85 dBAeq; 25% of users experienced levels of at least 90 dBA and 5% levels above 100 dBA. An analysis of exposure patterns indicated that some 5% of the sample were exposed to a daily 8-hr level which exceeded 90 dBA. In a followup study, Rice, Rossi and Olina (1987) determined incidence of PSS use and listening habits in 750 school children in Italy and England. It was found that 10% of the subjects had daily noise exposure doses of at least 87 dBA; 20 percent of the subjects reported sensations of fullness or ringing after listening sessions. Rice et al. concluded that the risk of hearing performance decrement following regular listining through PSSs for 10 years, according to British standards, was 1 in 1500. Although this analysis suggested minimal risk, Rice et al. cautioned that users experiencing symptoms reduce the volume of their PSS.

Chairwoman SCHROEDER. Mr. Stone, CEO of the SHHH Foundation, accompanied by Stephanie House.

We welcome both of you.

The floor is yours.

STATEMENT OF HOWARD E. "ROCKY" STONE, CEO AND EXECUTIVE DIRECTOR, SELF HELP FOR HARD OF HEARING PEOPLE, INC. [SHHH], BETHESDA, MD, ACCOMPANIED BY STEPHANIE M. HOUSE, STAFF COORDINATOR, SHHH

Mr. STONE. Thank you for the opportunity to be with you today.

Stephanie is our staff coordinator, and an intern from Libertyville, Illinois, Michael Meyer, is also with us.

I am profoundly deaf, but function as a hard-of-hearing person. I am the founder of SHHH, the largest organization of hard-of-hearing people in the United States.

Our professional colleagues that described the problem to us and given some indication of the nature of some of the remedies.

What I would like to mention to you this morning is that, in the small way we operate, we are trying to educate children throughout the U.S. on the dangers of noise. Our program was introduced in 1983, shortly after the noise abatement office was closed by the government, which we thought was a terrible mistake.

It is an innovative elementary school hearing conservation program that encourages children to take an active role in protecting their hearing. The program is designed to create a high level of interest through a variety of mediums, the most dynamic of which is the automatic sound-operated stoplight.

The stoplight may be permanently mounted in the noisiest area of the school, usually the cafeteria, or moved to any location. Similar in many ways to a traffic light, the instrument flashes green while sound levels are acceptable.

As soon as the sound level goes up, this light flashes yellow. When noise reaches an excessive sound level, which means there is a potential damage to the ear, the light turns red.

The use of the light system has two purposes—to bring about a reduced noise level and to create a standard of comparison for the children to apply in other noisy situations.

In addition to the sound-operated stoplight, the program provides a teacher's kit with a number of printed support materials for teachers to use for workshops and classroom instruction. The focus of the kit is to assist teachers in their own understanding of noise pollution and the effects of noise in our lives.

It is hoped the information contained in the kit's materials will enable the instructor to create in their students an awareness of noise as an environmental pollutant, explain the adverse effects of noise, identify major noise sources, describe noise control techniques and provide ways for students to become involved in working for a more quiet environment.

The workbook activities present a wide range of opportunities to learn through self-involvement and experimentation. Each teacher's kit contains the items that you see here.

A list of questions that may help bring out the essentials of the problem of noise is included in the program. The answers to these questions are contained in the kit's pamphlets and booklets.

There is a list of suggested projects and field trips related to the noise problem that may be incorporated as part of the class study. Eight cover posters, featuring "SHHHerman a Friendly Lion Who Does Not Roar," round out the program.

Prominently displayed throughout the school, the posters are meant to further raise the level of awareness with respect to noise in the environment and to remind the children of the potential dangers associated with excessive noise.

Operation SHHH is organized on the "Adopt a School" plan. Service clubs and other community organizations adopt an elementary school and pay the program costs of $500 for the stoplight and materials.

SHHH and professional volunteers work with the clubs and organizations to provide presentations and student activities which will increase the children's participation and interest in the program. Close cooperation of the school is essential, and in many cases we receive it.

This program is a response to the following: Americans are exposed on a regular basis to hazardous noise levels that could result in hearing loss.

Once considered an affliction of the elderly, hearing loss has reached alarming proportions among younger age groups. Already a pervasive handicapping condition, hearing loss is getting worse due to excessive noise in our lives.

It costs the individual and society much more to be rehabilitated. Prevention is obviously preferable.

Hearing loss from noise may start in childhood, says Dr. Mary Florentine. That is why education about noise hazards should begin before age 12.

Incidentally, we have tried to do this kind of a program with high school students, and it was not terribly effective. By the time students reach high school, they don't listen to people like me telling them what they should be doing.

So we really work in the first six grades of the elementary system and work in a way that doesn't point the finger at any one cause of noise, but educates the child before their mindset and lifestyle is put in concrete, that noise has a variety of impacts on their lives. Operation SHHH has been implemented in 23 states.

Overall results of the program have been positive. Schools developed creative methods of teaching about the hazards of noise.

One school produced skits to use with the program while another had essay and poster contests. A SHHH member in New York who works successfully with our program says that with education the children are becoming more aware and concerned.

They will be able to make intelligent decisions about what noises to expose their ears to. Hopefully, they can live their entire lives without having a noise-induced hearing loss.

Noise-induced hearing loss is permanent. Educating children about the dangers of loud sounds to their hearing is an extremely important mission.

We are talking very, very much about choice. When you say that this problem can be prevented, it really depends on whether or not the individual who is susceptible and vulnerable to noise really knows enough about it to make a choice not to put themselves in that situation.

We are really trying to help people understand this in the broadest sense so they can choose to avoid the kind of hearing loss that I have had to cope with for 40 years.

Believe me, even though you can be successful with it, the tradeoffs are very, very high.

Thank you very much.

[Prepared statement of Howard E. "Rocky" Stone follows:]

PREPARED STATEMENT OF HOWARD E. "ROCKY" STONE, CEO AND EXECUTIVE DIRECTOR, SELF HELP FOR HARD OF HEARING PEOPLE, INC. (SHHH), BETHESDA, MD

Good morning madam chairwomen and members of the committee. Thank you for inviting us here today. My name is Rocky Stone, I am accompanied by Stephanie House, our staff coordinator on noise, and an intern, Michael Meyer.I am profoundly deaf, but function as a hard of hearing person. I'm the founder of SHHH, the largest organization of hard of hearing people in American. This morning I'd like to tell you something about Operation SHHH.

Operation SHHH was first introduced, by Self Help for Hard of Hearing People, Inc., in 1983, as an innovative elementary school hearing conservation program that encourages children to take an active role in protecting their hearing. The program is designed to create a high level of interest through a variety of mediums, the most dynamic of which is the automatic sound operated stoplight.

The stoplight, produced by a Florida based manufacturing company, may be permanently mounted in the noisiest area of a school or can be easily moved among locations. Similar in many ways to a traffic light, the instrument remains GREEN while sound levels are acceptable, flashes YELLOW as a warning that noise is approaching the danger level, and turns RED when an excessive sound level has been reached and has become potentially damaging to the ear (refer to illustration A-1 for picture and complete specifications of stoplight). The use of the light system has two purposes: to bring about a reduced noise level and to create a standard of comparison for the children to apply in other noisy situations.

In addition to the sound operated stoplight, the program provides a teacher's kit with a number of printed support materials for teachers to use for workshops and classroom instruction.

The focus of the kit is to assist teachers in their own understanding of "noise pollution" and the effects of noise in our lives. It is hoped that the information contained in the kit's materials will enable the instructor to create in their students an awareness of noise as an environmental pollutant, explain the adverse effects of noise, identify major noise sources, describe noise control techniques, and provide ways for students to become involved in working for a more quiet environment. The workbook activities present a wide range of opportunities to learn through self-involvement and experimentation. Each teacher's kit contains:

Teacher's guide to noise pollution and hearing conservation.
16 page Special Report on Noise
Student's noise workbook
Sample activity charts for students
Brochure - "Think Quietly About Noise
Brochure - "Noise Around Our Homes"
Brochure - "Noise a Health Problem"

A list of questions that may help bring out the essentials of the problem of noise is included in the program. The answers to these questions are contained in the kit's pamphlets and booklets. There is also a list of suggested projects and field trips related to the noise problem that may be incorporated as part of the class study.

Eight color posters, featuring SHHHerman, a friendly lion who does not roar, round out the program. SHHHerman thinks noise is beastly. He shows ways in which we can tame noise and he is determined to help save our children's hearing.

Prominently displayed throughout the school, the posters are meant to further raise the level of awareness with respect to noise in the environment and to remind the children of the potential dangers associated with excessive noise.

Operation SHHH is organized on the "Adopt a School" plan. Service Clubs, such as Quota, Lions, Sertoma, and other community organizations, such as SHHH Chapters, adopt an elementary school and pay the program cost of $500.00 for the stoplight and materials. SHHH and professional volunteers, such as audiologists, speech-language pathologists, and educators in the hearing healthcare field, work with clubs and organizations to provide workshops, presentations, and student activities which will increase the children's participation and interest in the program. Close cooperation of the school is essential.

OPERATION SHHH IS A RESPONSE TO THE FOLLOWING:

* Americans are exposed on a regular basis to hazardous noise levels that could result in hearing loss.

* Once considered an affliction of the elderly, hearing loss has reached alarming proportions among younger age groups.

* Already a pervasive handicapping condition, hearing loss, is getting worse due to excessive noise in our lives.

* It costs the individual, and society, much more to be rehabilitated. Prevention is obviously preferable.

"Hearing loss from noise may start in childhood," says Dr. Mary Florentine, Professor of Audiology at Northeastern University in Boston. "That is why education about noise hazards should begin before age 12."[1]

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[1] SHHH Journal. May/June 1991. Noise-Induced Hearing Loss A Consensus, 11.3,pg.8.

To date, Operation SHHH has been implemented in 23 states. Overall results of the program have been positive. Schools have developed creative methods of teaching about the hazards of noise. For example, one school produced skits to use with the program, another has had essay and poster contests.

An SHHH member, in New York, who works successfully with our program says, "With education, the children are becoming more aware and concerned. They will be able to make intelligent decisions about what noises to expose their ears to, and hopefully they can live their entire lives without having a noise-induced hearing loss." Because noise induced hearing loss is permanent, educating children about the dangers of loud sounds to their hearing is an important mission.

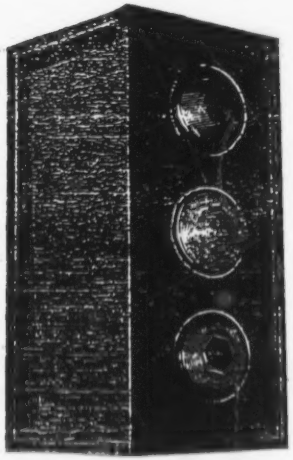
SHHH is a non-profit, educational organization for hard of hearing people, their relatives and friends, who are devoted to the welfare and interests of those who cannot hear well.

For information on membership, general programs, the SHHH Journal, or the SHHH Annual Convention, contact: SHHH, 7800 Wisconsin Avenue, Bethesda, MD 20814. Phone: (301) 657-2248 (voice), (301) 657-2249 (TDD).

STOP NOISE!!

WITH AUTOMATIC SOUND OPERATED

STOPLIGHT



- GREEN for acceptable sound levels
- YELLOW warning for momentary excessive sound
- RED for sustained excessive sound

FEATURES:

- ☐ circuitry filters momentary sounds
- ☐ adjustable sound level sensitivity
- ☐ adjustable timer/sound controlled red light periods
- ☐ intermittent auditory warning beeps during yellow light operation
- ☐ one-second buzzer announces onset of red-light periods
- ☐ includes 50 feet of lead wire for remote positioning of microphone/sensor (included)
- ☐ operates economically with standard 110 volt AC current
- ☐ fire resistant lightweight molded plastic construction
- ☐ low wattage lamps included

APPLICATIONS:

- ☐ instructional aid
- ☐ hearing loss education
- ☐ objective noise detection and control
- ☐ classroom behavior management
- ☐ lunchroom noise reduction

SPECIFICATIONS:

- ☐ stoplight head dimensions: 34⅛ inches tall
  11⅛ inches wide
  13 inches deep
- ☐ optional painted heavy metal base and 1⅛ inch PVC column permits adjustable height of stoplight up to 7 feet
- ☐ complete, easy set-up instructions included
- ☐ six-month parts and service guarantee

Self Help for Hard of Hearing People, Inc.
7800 Wisconsin Ave.
Bethesda, Maryland 20814

Mr. STONE. We have copies of an issue of our magazine on noise available for all of you in the audience who would like to pick them up after our testimony.

Chairwoman SCHROEDER. Thank you very much, Mr. Stone; we appreciate that.

Before I go one step further, let me thank again the sign interpreter for the record. His name is Mark Webber. We have really put him through a lot this morning by not having two.

We really thank you for your hard work, Mark.

Let me yield now to Congressman Durbin.

Mr. DURBIN. Thank you.

Dr. Brookhouser, I really appreciate your testimony.

Since I come from downstate Illinois in a farming area, there is an aspect of this which often goes unnoticed. You think of people living around airports in big cities, jackhammers and the like being exposed to so much noise that it is harmful.

You made, I think, a valuable contribution to remind us that young boys and girls using the farm equipment are also being exposed to the same problem.

We have an extension service we fund nationally that tries to educate farm families and young men and women about aspects of agriculture. I am involved in the committee that funds that.

Do you know of any effort by the extension service to try to alert people around the farm communities about some of these dangers to hearing?

Dr. BROOKHOUSER. I am not specifically aware of that, no. I know there have been at times programs funneled through organizations like the Future Farmers of America.

They were involved in some studies showing that children that did chores did, in fact, have more loss than ones who were not involved directly.

One distinction about our data is that 90 percent of these children were males. This is definitely a disorder that is higher in the male population than the female population largely—in the youth area.

I think it largely has to do with recreational activities, a greater likelihood of going hunting, et cetera. On the farm there is more opportunity for recreational use of firearms to go pheasant hunting or whatever.

To my knowledge, and we can check on this for the record, there are not specific educational efforts underway now aimed at the farm family.

Mr. DURBIN. We will look at that. I think that is an important aspect of this. An element that hasn't been mentioned here, what is the psychological impact of loss of hearing; is it all physical?

Do you find people who are losing hearing or have lost hearing have some overall psychological challenge or problem as a result of it?

Mr. STONE. I suggest I can answer that rather than our professional friends.

Mr. DURBIN. Why don't you start, Mr. Stone?

Mr. STONE. The thing we have learned over the last 12 years dealing with thousands of people with hearing loss is that the problems are largely psycho-social. If you are born deaf, that is a differ-

ent kind of situation than losing something that you had once possessed, particularly something as significant as hearing.

There have been a number of different studies as to whether or not we are paranoid because when we can't hear people in a group, smiling and talking, we are sure they are talking about us. There is no real evidence that people who have hearing loss are anymore paranoid or schizophrenic than the normal person.

But there are strains that are involved. If you lose your hearing later in life—this is getting away from children—and you are going through male menopause, you didn't get your last promotion and you are having trouble with your spouse and the kids, that loss of hearing becomes very significant in terms of all the other problems a lot of people have.

Most of the people we found who have joined SHHH do not understand what is happening to them when they lose their hearing. They think they are losing something else.

Their human qualities, their capabilities. There is a great deal of psychological involvement.

I am sure our friends might have something to add to that.

But we feel the ignorance involved concerning the condition is so great that the first thing we have to do with people who join our organization is to educate them about what really has happened to them as opposed to what they think might have happened to them.

Mr. DURBIN. Dr. Brookhouser.

Dr. BROOKHOUSER. The only thing I would add to that, and that is you can't see sound. When I can't read a newspaper, I realize there is something wrong with my eyes.

The average person doesn't know what they are not hearing. I remember the late Senator Percy mentioned he was sitting in meetings at Bell and Howell for a long time and didn't understand things and didn't know what was going on.

I think hearing screening should be made a part of the annual physical examination. It is not in most instances.

It ought to be done to a greater extent among the adolescent population. Most of the tests aim at the elementary population.

Once you know you are experiencing loss, I think you are more apt to do something about it. If someone looks at it and says you have got a hearing loss, you are likely to focus on it more.

We need to make use of appropriate amplification a more socially acceptable thing. Many people will wear eyeglasses.

But you have older people who will come in and not wear a hearing aid because it is the final evidence to them of growing old. That is not the case at all.

The ability of some of these devices today to restore near normal auditory performance is remarkable and people ought to be willing to accept that.

Mr. DURBIN. President Reagan brought that whole discussion out in public and helped increase the acceptability of hearing amplification devices.

Mr. CLARK. Speaking as a scientist, noise-induced hearing loss is a three-stage process. The first process is permanent loss of the sensory cells of the inner ear.

Each of us is born with 16,000 sensory receptor cells. These cells are killed by excessive exposure to noise and replaced by scar tissue.

Although there is hope of developing techniques to regenerate these cells, it has not yet been demonstrated. The problem is 30 to 50 percent of these cells can be lost before any measurable impairment of hearing ability.

A physician cannot detect the beginning stages of noise-induced hearing loss.

The second stage is when hearing losses begin, they begin in the high frequency regions, the highest note of the piano, these losses are not usually noticed by the patient unless he has his hearing tested for some other reason.

As the noise exposure continues, the losses get worse and begin to spread to the lower frequency, important for understanding speech. It is often at that point that the patient reports to his physician that his wife is beginning to mumble. He doesn't often notice it has been such a cumulative process, it is really quite significant before it is really noticed by the patient. By that point, if it is diagnosed as a noise-induced hearing loss, the physician makes the recommendation for treatment to that patient, that is to avoid excessive noise exposure. That recommendation should have been made 30 years ago, of course.

That is why I am emphasizing the important role of education so our children can understand that the noise exposure which will eventually cause hearing loss is starting now and not at the end of a lifetime.

Mr. DURBIN. That is a very good point.

I thank this panel very much for their contributions. As I have mentioned to Chairwoman Schroeder during the course of it, I have come up with a half dozen ideas of areas we should work on. The Federal Government is a major factor when it comes to vocational education.

I wonder if we are establishing any kind of standards when it comes to the shops at high schools and vocational schools in terms of hearing dangers involved. Those are things to look into.

Thank you for joining us. You are an excellent panel.

Chairwoman SCHROEDER. Thank you.

Congressman Barrett.

Mr. BARRETT. Thank you, Madam Chair.

I continue to be struck by the unanimous agreement that education seems to be the ultimate answer. I was also impressed about Dr. Brookhouser's comments about agricultural noises and the potentially harmful noises on the farm.

Yet, I think you also said earlier, Dr. Brookhouser, that there are no regulations which currently apply to the prevention of hearing loss on the farm. Would you enlarge on that?

Dr. BROOKHOUSER. The OSHA regulations to my knowledge exempt the rural applications. I think even short of regulations, I think one point that Congressman Durbin made, intensive educational effort on the farm immediately, not waiting for regulations, would make a lot of sense.

There are ways in which machinery can be altered through home repair and things like that that would remove sound-protec-

tive devices. That may occur even if you do attempt to put sound-protecting devices on.

To my knowledge, there have not been regulations specifically applied to farm equipment.

Mr. BARRETT. That would be one area you would recommend perhaps targeting.

In terms of differences which apparently exist in the susceptibility of hearing loss, is data available with regard to boys versus girls, rural versus urban, anything like that?

Dr. BROOKHOUSER. The only data I am aware of about susceptibility has been gathered between the boy-girl breakdown. There have been rural-urban looks taken. They looked specifically at farm children who are in vocational agriculture to see if they had losses that would be greater than urban populations. It depends a little on your choice of urban population. If you got kids from an environment where they would have been exposed to higher intensity noises, you might get a different group.

The boy-girl mix does not appear to be in any way determined by intrinsic characteristics of male versus female. I think it is much more to do with their environmental exposure and their selection of leisure time activities and exposure to things like air hammers.

One of the things I think people have to be aware of is that their child can choose a career that has nothing to do with noise. Yet, in the course of a summer job, working on a street crew, he or she can lose their hearing. It impacts everybody even if they don't end up working in a regulated noise environment.

Mr. BARRETT. Dr. Clark.

Mr. CLARK. There have been scientific studies conducted addressing this issue of susceptibility. All of the differences we see in field studies appear to relate to differential patterns of noise exposure rather than differences in susceptibility.

There have been suggestions in the literature that people with blue eyes are less susceptible than people with brown eyes related to melanin content. There have been field studies indicating American blacks were less susceptible to noise than American whites. Most of those studies have flaws in them that make the data unreliable.

A consensus can be stated there is no difference in susceptibility between American men and women. It relates to differential patterns of noise exposure.

Dr. BROOKHOUSER. One group of children many researchers have focused on were the high-risk neonates. We know in certain animal species that certain animals at the earliest phase of their development do appear to be more sensitive to damage from noise.

Studies were done of neonatal intensive care unit noise environments. We found some of the incubators kids were in were generating significant sound levels. Some of the alarm devices were generating significant sound levels. The tendency to tap on the top of an incubator to see if a child responds generates significant sound levels. Voluntary efforts have been undertaken by the people staffing those units to try to reduce the noise level—because you are talking about multiple months of exposure.

There is reasonable data that certain types of drugs, primarily certain types of powerful antibiotics may add to the effect of noise.

If you are taking the medication and have noise exposure at the same time, you may get more damage from it. The educational effort there has been undertaken in the medical community.

Mr. BARRETT. Thank you.

Dr. Clark, you mentioned, on the first page of your testimony, 25 percent of Americans 65 and older do have hearing problems. You suggested that may be due to not only the aging process but perhaps a lifetime of environmental noise.

Any data which would give us any reading as to how much is the aging process, how much is environment?

Mr. CLARK. That is hard to put a precise number on. The data I referred to are data used to determine the hearing levels of Americans in the OSHA standard and in studies of hearing levels of nonexposed individuals who don't work in noisy industries.

On the other hand, if surveys are conducted of what are called highly screened individuals, where you carefully eliminate all types of exposures, the comparison population shows much better hearing.

Traditionally, we thought of presbycusis as being just due to the aging process. But it is clear, and I think everybody agrees, that much of that hearing loss that we call the effects of aging is really age-related hearing loss, not age-induced. It is related to ear disease and exposure to environmental noise. I will bet you it is at least 50 percent of the loss, but I can't give you that number from the studies. It is not available.

Mr. STONE. I am glad you made that point about age-related rather than age-induced. There is a tendency to believe as you age you inevitably lose your hearing. That has never been proven.

The chief source of research that indicates how older people can have the hearing acuity of younger people if they live in a less noisy environment is a study done in the Sudan. I lived in the Sudan for a number of years. I tell you, it is quiet. Most of the people over there have very, very sharp hearing.

I think we are drowning in noise. We need things like the Noise Abatement Office that was abolished in 1982. If we can get that back, it might be helpful.

Subsequent to 1982, the regulations that are on the books have been very, very seldom enforced. It is a major problem. I think we need government intervention.

Mr. BARRETT. Thank you, Mr. Stone. I appreciate that comment.

I also appreciated some of your specific recommendations in your testimony, for example, volume control logo painted red for volume settings.

Did I understand you to say yours is a private nonprofit corporation?

Mr. STONE. Right. We are self-supported. We don't get government funding.

Mr. BARRETT. Thank you.

Thank you, Madam Chairwoman.

Chairwoman SCHROEDER. Well, thank you.

Let me first ask Mr. Stone some more about these materials. How many schools do you have the materials in now? How long have you been putting them out? How many schools are they in? What kind of feedback are you getting?

Ms. HOUSE. We get great feedback from the materials we hand out. The program has been handed out within school districts. It is difficult to give a number as to how many schools have the program set up. It is implemented in 23 states.

A number of the states or regions within the states share the program by transporting the particular stoplight from one school to another. That is a procedure that we are working on also.

Chairwoman SCHROEDER. For $500 a school district could get one kit and pass it around, but we are still not even in more than 23 states?

Ms. HOUSE. Exactly. At this point, it is implemented in 23 states. Although we have 250 chapters who are dedicated making the program known, the stoplight raises the program cost to be $500. Consequently, a lot of the materials are out there without the stoplight. Awareness is having an impact on the program itself.

Mr. STONE. The schools frequently do not have the $500. We are only 12 years old, which isn't very long in terms of getting out a lot of procedures to all points of the organization.

Interestingly enough, the people in the chapters are so concerned about it that they put in money of their own and pay the $500 for the materials. Then they work with the school to conduct the program.

In one state we know the stoplight has been circulated to at least 10 schools. I don't know whether we have 50 or 60 or 70 schools in the program. It is still small.

What has happened is the teachers like it very much not only because of hearing loss and noise, but it helps them with behavior modification. They can get their messages across at lunchtime without using these huge electronic megaphones. The children seem to respond to the program pretty well, particularly when they go on field trips. It gives them experience in how to communicate over noise; to see whether or not workers are wearing the kind of ear protection they are supposed to but which they reject in many cases.

We try to expose them to people like myself who have a hearing problem and indicate to them the kind of price they will have to pay if they don't think about this seriously and make a choice to keep their hearing, which they can do.

Chairwoman SCHROEDER. We salute you. When Dr. Brookhouser was testifying about the incubators, it really shows you how totally insensitive we are to this problem as a society. Thank you for filling in some of those gaps.

Dr. Brookhouser, I had a question for you, too. Do you know if we are doing anything in music education, educating people about hearing loss and how they should take care of their ears?

Dr. BROOKHOUSER. I don't think to the extent we should. There is interesting data that has been published on non-amplified music. That is just people in symphonies playing acoustical instruments. A number of them do have significant noise-induced losses which in the long run impacts their ability to continue their work.

I think we focus only on the electronically amplified devices. But particularly violinists show significantly different thresholds. This was done on the Chicago Symphony. There were significant losses, and many of them are aware of that.

There are now ear protective devices being designed which allow them to protect themselves against some noise while still being able to monitor what they are playing on their instruments.

In the area of education, the Sertoma organization has undertaken this effort also. They should get some plaudits. They have now developed videos that have been shown to four million schools, or rather four million school children, and the new National Institute on Deafness and Other Communication Disorders, it has established by congressional legislation, research and training centers that have dissemination elements in them. Several of them are under way. And also the National Clearinghouse for Information in this area.

Hopefully some of the private initiatives will be pulled together and packaged in such a way that people are at least aware of them so that, as you add new things on, we won't be duplicating something that is already under way.

Chairwoman SCHROEDER. I was over at Georgetown University and saw the buildings that have been built obviously a long time ago with pillars and all sorts of fancy things. I said, "What is that?" They said both Alexander Graham Bell and his father had been married to women who were hearing impaired. This is the great foundation that they founded. People have been trying around the edges, but we have not broken through this noisy society.

Dr. Clark, as an academic, when we look at this and see so many young men being more at risk, should we target our message more to young men? I find there is a certain age where they have to be cool. Being cool is probably not putting anything in your ears.

So how do we break that down? Or putting anything over your ears? It is easier to get young women to wear boots and mittens and all sorts of things. How do we target this? Should it be more gender specific in its targeting?

Mr. CLARK. Well, I think everyone is equally susceptible to noise, so everyone should be equally educated. Just because today the patterns of exposure are different between men and women does not mean those patterns will not change during the next decade.

We see more and more intermixes in the types of activities in which our children engage. I think it is probably more cost effective to educate both genders. So I don't think there is any reason to specifically target males over females. I think everyone needs to get the message.

If they all take it into consideration, there will be more of an effect observed in two or three decades' period of time. Without educating the women, I think you might see a change in the other direction for women.

Chairwoman SCHROEDER. What do you do with this precocious five-year-old female that has now figured out how to change the volume?

Mr. CLARK. I am the victim of two precocious children. With a personal stereo, it is impossible for a parent to monitor that environment. Most other kinds of things your child engages in, you can look out the window and see if he is hanging by one leg from the swing set and go out and correct him or hold your breath.

With a personal stereo, it is possible for the child to play the stereo at a level that is hazardous, and you won't know anything about it unless you happen to be in the same room or close by.

What I do is, when my kids are listening to these stereos, and I do—I don't tear the stereo away from them, but about every hour I take it off their head and I listen to it myself, and I always have to turn it down.

As our ears are exposed to excessive noise, we definitely have a temporary hearing loss. The loudness of the noise goes down, and there is a subconscious tendency to turn the volume up. After an hour or two hours of listening, a much higher volume is needed. If you don't believe me, get in your car in the morning, and the radio will appear to be blasting away at you.

Now, part of that has to do with the highway noise, but much of it has to do with the fact you have now given your ear, overnight, time to rest. So there is really a double danger there.

Chairwoman SCHROEDER. So the temporary hearing loss can be just as dangerous?

Mr. CLARK. Repeated temporary hearing losses will lead to eventual permanent hearing loss.

I would like to make another comment related to this issue. It has to do with the question raised early about providing hearing protection with noisy power tools. I think that is an excellent idea. It is such a good idea, I had it a number of years ago and contacted the Nation's largest retailer of power tools. I won't tell you the name of the company; if you are a craftsman, maybe you can figure out who they are.

This company, I recommended they provide ear protectors with each of their power saws. Someone in marketing said, "Someone will call you." Eventually, I got a call from a lawyer: "No way—providing a hearing protector is an admission of liability; it implies these devices are dangerous, and we will not do it."

I think we are doing the wrong things in this country about liability. I think there should be a cost to these manufacturers for not making safe products.

Chairwoman SCHROEDER. I think that is one of the saddest things about today's hearing, because we really had hoped the electronics industry would join us, but they are not here.

I thought Congressman Durbin made a good point. They should understand protecting people's hearing keeps their customers longer. They won't sell a lot to people who can't hear it.

Your point is very well taken. In this society, it has become that way, and we only leave ourselves at risk until suddenly it all blows up and everybody is suing.

Congressman Durbin, did you have anything to add?

Mr. DURBIN. I want to thank the panel and the select committee for this hearing. It is unfortunate we don't have any industry spokesmen for panel three.

Dr. Clark, that is the first thing that came to my mind as an attorney who used to be involved in litigation: if they gave away the earplugs, they would be conceding the fact they had a dangerous product. We can get around that; there are ways to take care of that.

Legislation can be enacted to protect that evidence from coming in to trial at some subsequent time if, in fact, they do the right thing. We should be doing it on a coordinated basis. I will say, despite the fact people from the private sector were not with us today, by and large, we will invite them to meetings where there may not be cameras and microphones.

What I have gotten out of this morning's hearing is the fact, hearing damage is virtually ignored. We are ignoring it in the incubators of the just-born. I don't know if a hair dryer that I held next to my head in the House gym this morning went over the limit. I am sure people in the audience didn't think of that. It is a concern; it is a danger that can be avoided; and it is one that is real.

With the education of Mr. Stone's group and so many others, and your fine testimony, I think we have taken a step in the right direction.

Thank you, Madam Chairwoman.

Chairwoman SCHROEDER. Mr. Stone.

Mr. STONE. The implementation of ADA is going to cause industry considerable grief if they don't take an interest in what are proper noise levels and proper presentation of amplification. They will soon have to put different types of amplification in a variety of sites.

If, in the process, new companies spring up and try to provide compliance with the law at the lowest cost, without reference to proper instrument design, the providers will be in danger of being sued if hearing is lost by using too much amplification.

Chairwoman SCHROEDER. I think that is a very good point to adjourn on. You are absolutely right, and I think every one of us has to be much more mindful of this whole area.

Let me thank the panel one more time. I want to remind people, the record will be open for two weeks. If people think of more things we should put in the record, please feel free to let us know. We will be very happy to add things to it.

If the private sector wants to add anything in the next two weeks, we will be happy to have that, too.

With that, we adjourn the hearing.

[Whereupon, at 11:40 a.m., the committee was adjourned.]

[Material submitted for inclusion in the record follows:]

PREPARED STATEMENT OF THE AMERICAN ACADEMY OF OTOLARYNGOLOGY—HEAD AND NECK SURGERY, INC., ALEXANDRIA, VA

The American Academy of Otolaryngology-Head and Neck Surgery appreciates the opportunity to present formal comments to the Chairman and Members of the Select Committee on Children, Youth and Families on the issue of noise-induced hearing loss in children and teenagers.

This Academy is the largest organization of otolaryngologist-head and neck surgeons in the world with more than 9,200 members, including 96% of all board certified otolaryngologists. This specialty encompasses surgeons whose expertise involves the management of disorders of hearing, balance, the facial nerves, the nose, facial bones, as well as benign and malignant disorders of the mouth, trachea, larynx, thyroid and esophagus.

At least 10 million of the 28 million Americans with hearing problems can blame them at least partly on exposure to loud sounds. Sounds that are sufficiently loud to damage sensitive inner ear structures can produce hearing loss that is not reversible by any presently available medical or surgical treatment. Noise-induced hearing loss is cumulative. Excessive noise at work or play is the most common

preventable cause of hearing loss. Now that Americans are living longer, it is more important than ever to educate young people on how and why to protect their hearing.

Habitual exposure to loud noise will cause a gradual hearing loss and, for unprotected ears, the rate of loss is dramatically accelerated. Individuals with hearing loss may not notice any problem at first, but eventually the ability to clearly understand speech may become impaired. Optimizing personal communication is a critical factor for economic growth of the individual and the nation in this so called "era of the communication society."

Noise-hearing loss is different from other types of sensorineural hearing loss in one important way--it can be reduced or prevented altogether by limiting exposure. When noise is too loud, it begins to kill the nerve endings in the inner ear. As the exposure time to loud noise increases, more and more nerve endings are destroyed. As the number of nerve endings decreases, so does hearing. There is no way to restore life to dead nerve endings; the damage is permanent.

A ringing in the ears, called tinnitus, commonly occurs after noise exposure, and it often becomes permanent. Most tinnitus comes from damage to the microscopic endings of the hearing nerve in the

inner ear. The health of these nerve endings is important for acute hearing, and injury to them brings on hearing loss and often tinnitus. Exposure to loud noises is one of the leading causes of tinnitus in today's world.

Intensity of sound is measured in decibels (dB). The scale runs from the faintest sound the human ear can detect, which is labeled 0 dB, to over 180 dB, the noise at a rocket pad during launch. Decibels are measured logarithmically: 20 decibels is 10 times the intensity of 10 decibels, and 30 decibels is 100 times as intense as 10 decibels. Many experts agree that continual exposure to more than 85 decibels may cause permanent hearing loss if endured for 8 hours per day for a prolonged period.

Many headphone cassette radios produce sound at levels greater than 100 dB. Reversible damage to the inner ear (called temporary threshold shift or TTS) can occur from listening just once at levels near the maximum output. With repeated exposure, permanent sensorineural hearing loss may result.

A pilot study conducted at the University Hospital in Iowa City in 1984 found TTS of 10 to 30 dB following three hours of headset listening by 7 out of 16 teenagers. The study was initiated after an unexplained high frequency sensorineural hearing loss was diagnosed in a teenager treated at the hospital. Hearing had

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returned to normal when the patient was seen at a six month follow up visit. At that time, the mother related that her son's headphone set, which he used several hours each day, had broken since his initial visit. In a test of three headset radios selected at random, all were found capable of outputs in excess of 120 dB at the highest volume setting.

The majority of the pilot study volunteers used their headphone sets 2 to 3 hours a day, and one reported an average daily use of 6 hours. They were asked to not use their headsets or be exposed to loud noise for 24 hours prior to the test. Pre-test audiograms were obtained, and then the volunteers were instructed to use their headphone sets continuously for three hours at their usual listening level. Another audiogram was done immediately thereafter to determine if any ear damage had occurred.

At the conclusion of the test, 11 of the 16 admitted to tinnitus with exposure to noise. When asked if their hearing was worse after noise exposure, eleven responded positively. The audiograms for all volunteers returned to normal on the final test 24 hours later, suggesting that this brief exposure had caused temporary damage. Structural damage from a TTS may include subtle intracellular changes in the sensory hair cells and swelling of auditory-nerve endings in the inner ear. More recently, researchers have concluded that if the sound exposure continues on a regular basis, permanent

threshold shifts (PTSs) will result and hearing loss will occur.

The Academy has advertised and made available to the medical community and the public free pamphlets on noise-induced hearing loss in the workplace and at home. We have also launched an environmental campaign which addresses noise pollution and hearing. This is a concerted effort between the Academy and the National Institute on Deafness and Other Communications Disorders to create educational programs targeting children, parents, hobby groups, and professional role models on the unnecessary economic and social losses that are the result of hearing loss.

At the Academy's September 1991 annual meeting, the founders of Hearing Education and Awareness for Rockers (HEAR) will present "The Effect of Rock Music on Adolescent Hearing Levels." HEAR, which has received national media attention, is an organization which encourages hearing awareness in rock industry patrons and workers.

SUPPLEMENTAL STATEMENT OF THE AMERICAN ACADEMY OF OTOLARYNGOLOGY—HEAD AND NECK SURGERY, INC., ALEXANDRIA, VA

Firecrackers and July 4th: Exposure to Impulse
Noise Poses Serious Threat to Hearing

ALEXANDRIA, VA--Baseball, barbeques, beach parties, parades and fireworks displays are all part of the traditional Fourth of July celebration. But firecrackers need very special handling, cautions the American Academy of Otolaryngology--Head and Neck Surgery, an organization of more than 9,000 physicians who treat both the medical and surgical disorders of the ears, nose, throat, and related structures of the head and neck.

Fireworks, ranging from the small inch-long type to cherry bombs, create an impulse noise that poses a serious threat to hearing when set-off within close range.

"The sudden, extremely loud sound from a firecracker or gunfire happens so quickly that people do not have time to protect themselves," said Paul Lambert, MD, chairman of the Academy's Medical Aspects of Noise Subcommittee. "Impulse noise can create dangerously high noise-levels, around 160 decibels. Such an intense sound may cause immediate damage to hearing."

The average noise produced ranged from 125 to 160 decibels, from a distance of 10 feet. "The closer any explosive goes off near the ear and the louder the impulse noise, the greater the risk of damage," said Dr. Lambert.

Impulse noise literally shakes away the tiny cells of the nerve endings in the inner ear. These cells are critical in transmission of sounds to the brain. "Once damaged, they do not regenerate and result in deteriorated hearing," said Dr. Lambert.

"Voices may sound muffled, and the ears feel clogged and blocked. This sudden hearing loss may subside after a few days, yet if the damage is serious, full hearing ability will never return." The residual effects usually include reduced perception of high frequency sounds, making speech harder to understand. Ringing in the ears may also occur, even after a single impulse noise exposure. Ringing in the ear after any noise exposure is a serious warning that the noise was too loud.

"Cap guns are another source of hearing damage. Children tend to point them close to the head and ear region, and at that close range, repeated firing could cause hearing loss," said Dr. Lambert.

While firecrackers have been banned in many states, they are still part of the Fourth of July tradition. The Academy recommends the following guidelines for using firecrackers and other explosives this Fourth of July:

- Never let young children use any kind of explosives.
- Use explosives only outdoors. Enclosed areas intensify the impulse noise and increase chances of hearing impairment, fires, and other damage.
- After igniting, get as far from the explosives as possible.

- Always cover your ears when explosives are detonated. If someone else is using them, press your ears shut with your fingers. This will lessen the noise somewhat.

For more information on noise and how it can affect your hearing, the Academy offers a brochure, "Noise, Ears and Hearing Protection," that discusses many commonly asked questions and includes a chart of decibel ratings for everyday sounds. Send a self-addressed, stamped envelope to: AAO-HNS, "Noise Brochure," One Prince Street, Alexandria,

SUPPLEMENTAL STATEMENT OF THE AMERICAN ACADEMY OF OTOLARYNGOLOGY—HEAD AND NECK SURGERY, INC., ALEXANDRIA, VA

WHEN SHOULD YOUR CHILD'S HEARING BE TESTED

ALEXANDRIA, VA--Because most of us think in terms of "deaf" or "not deaf," we tend to neglect the middle ground of hearing loss. A mild hearing loss can impair learning if not detected and treated early in life, according to the American Academy of Otolaryngology-Head and Neck Surgery, the association of 8,000 physicians who specialize in treating disorders of the ear, nose, throat, and other areas of the head and neck.

According to the chairman of the Academy's Pediatric Otolaryngology Committee, Dr. Donald Hawkins, certain children are at risk for hearing loss. A newborn who fits into any of the categories below should be tested as early in life as possible, preferably before 3 months of age. (Modern computerized hearing testing makes it possible to test newborns as early as one day after birth.) Hearing testing criteria for newborns include:

- o family history of hearing loss, including brothers or sisters
- o history of illness in the mother during pregnancy, use of drugs during pregnancy, prolonged labor, or premature birth
- o presence of other birth defects
- o low birth weight or other physical problems at birth (e.g. jaundice)

-MORE-

BEST COPY AVAILABLE

You can do some simple things to confirm normal hearing in your infant. Is your baby is soothed by your voice? Does your baby turn its eyes and head to search for the location of sound? Does your baby imitate its own noises? If your child is not developing language skills, not attempting to talk by age one, misunderstanding communications, or if you suspect a hearing problem, contact your pediatrician or otolaryngology-head and neck surgeon.

As children get older, there are several symptoms of possible hearing loss that parents with children aged 6 months - 2 years can watch for. A child may have a hearing problem if s/he:

- is not startled by loud noises
- does not awaken to loud household noises
- does not turn to look toward sound
- does not respond to their own name

"Often, a parent's 'intuition' will help uncover a hearing problem," says Dr. Hawkins, "especially if the child fails to demonstrate certain developmental 'milestone' activities." In the first four years of life, the child learns how to communicate--first to understand what people say, and then to start talking. To do this, your baby must have usable hearing.

All children should have their hearing tested before starting school. This will detect unilateral hearing loss (loss in one ear), which may cause difficulties in identifying the source of sounds in noisy settings.

State guidelines for school testing of children's hearing vary. However, most states call for a yearly examination for

children ages three through third grade and any high-risk child above third grade. High-risk children for hearing loss are those who:

- repeat a grade
- require special education
- lack a record of previous normal hearing exam
- were absent or not enrolled during a previous hearing exam
- failed a previous hearing exam
- have any speech, language or other communication problem, or have a medical problem associated with hearing loss.
- experience frequent or recurring ear infections

During a typical school's hearing test, the child listens through earphones for quiet musical-like tones produced by a testing machine (audiometer). This test is to identify those children with possible hearing impairment that could interfere with communication. Long periods of diminished hearing may effect learning although the data is inconclusive.

Inability to respond to one or more sounds in the earphone, in either ear, may signify a hearing loss. This may simply be a temporary condition such as that caused by a head cold or ear infection. Nevertheless, retesting should be performed by an audiologist to determine if there is a hearing problem. If the child fails again, he should first be seen by his pediatrician, and then a comprehensive hearing evaluation should be performed under the supervision of an otolaryngologist, the only hearing health care professional trained to provide total ear care. Aural rehabilitation is usually done in association with an audiologist.

Children with sensorineural ("nerve") hearing loss, which is usually permanent and not correctable with medicine or surgery, need careful testing by a pediatric audiologist to determine the amount of hearing loss, and the type of hearing aids and therapy to help them adjust to the disability.

The other hearing problem involves the outer or middle ear, and is known as conductive hearing loss. This loss is often caused by frequent ear infections and is generally temporary and correctable with medication or surgery.

If your child has a hearing problem that cannot be corrected with medical or surgical treatment, it is important to realize that assistance (rehabilitation) is available and should be started promptly. Many assistive devices and training programs make use of remaining hearing and allow them to lead productive lives.

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Editor's Note: For information on adult hearing testing and suggestions on how to find a qualified otolaryngologist, contact the Academy office at 703/836-4444.

PREPARED STATEMENT OF MARTHA J. LOCKWOOD, CAE, APR, EXECUTIVE VICE PRESIDENT, CAR AUDIO SPECIALISTS ASSOCIATION/VEHICLE SECURITY ASSOCIATION, WASHINGTON, DC

As representatives of the mobile electronics industry, the Car Audio Specialists Association\Vehicle Security Association (CASA\VSA) shares your concern about the ability of our young people, and their parents and grandparents, to be discerning listeners throughout their lifetime.

Our members include a diverse group of manufacturers, distributors, retailers, installers, and sales representatives throughout the United States and in several foreign countries. The autosound industry, which forms a portion of our membership, has pledged to assist in solving the problem that results from abuse of autosound equipment.

We have pledged our assistance and full cooperation in taking positive steps toward solving what is not only an environmental issue but also a social issue. Controversies over the loud playing of car stereos have gained a fair degree of media attention. This coverage has captured the attention of citizens disturbed by the problem, government officials, including this Select Committee, and organizations such as CASA\VSA.

The social ritual of "cruising" by many of our young people has brought with it traffic congestion and noise, including excessively loud car stereo in many cases. Central to the disputes about what is considered an "unacceptable" or "objectionable" level is the question: At what point does a car radio cease to exist for the sole entertainment of the driver and/or passengers and begin to become a public nuisance?

We cannot deny that some enthusiasts have overstepped the bounds of propriety and personal safety by turning up the volume of their car stereos to excessive levels. The high-powered equipment which is essential for producing high-quality sound is a product of state-of-the-art technology. The equipment, however, is not the problem; it is the abuse by users of such equipment that is our concern. Unfortunately, in attempts to draw the line between personal enjoyment and public annoyance, local governments have gone forward with legislation that is often more stringent than existing noise statutes.

According to previous testimony, there are many sources for hearing loss

in youngsters: 14 percent from heredity; nine percent from meningitis; nearly five percent from infection and fever; and another five percent from prematurity. The remaining 50 percent of the reason for this loss is unknown, but certainly comes from a variety of sources, certainly not all related to entertainment sound.

Solutions

While CASA\VSA supports strict enforcement of existing general noise statutes, we believe that proactive approaches to the problem lie in behavior modification in our local communities where the problem exists.

Industry pledges its assistance and full cooperation in taking positive steps toward solving what is not only an environmental, but also a social issue.

Consumer Education

CASA\VSA, and its allied associations in the mobile electronics industry, support a nationwide consumer education program which our industry is conducting to caution the public against excessively loud playing of autosound systems that cause public disturbances, that impede the flow of emergency vehicles, and that potentially damage the hearing of users of the equipment. A goal of the program is to redirect consumers' interest to sound quality and away from sound levels. In joint venture with a hearing research organization, we also deliver a message of "safe sound."

Celebrity spokespersons are being brought into the project to appeal to autosound enthusiasts with campaign messages. The campaign that will include public service announcements, articles in youth-oriented publications, and advertisements, began this year with funding secured in 1991. Jeff Baxter, former member of the Doobie Brothers and Steely Dan bands, began to protect his ears 14 years ago as he performed. Now he serves as chairman of the Hearing Is Priceless (HIP) campaign. Working with him is former MTV personality and rock correspondent Nina Blackwood to educate early teen and adolescent children about safe sound. Baxter points out that he is one of a few members of his old group able to discern the full range of music today because he wore ear phones when he was younger.

Alternative Cruising Programs

CASA\VSA also pledges its assistance in working locally to help develop and seek successful execution of alternative cruising programs as a means of redirecting cruisers away from residential areas of cities to other locations where their interest in autosound will not create public disturbances.

A program in Phoenix, Arizona, now beginning its third year, could serve as a model for adoption and modification in other cities troubled by cruising congestion and excessive autosound noise. The city's "Jamzone" offers a healthy attraction to sound enthusiasts who find entertainment, sports activities, and other car and autosound-related activities on-site an alternative to city cruising.

Through CASA\VSA, whose members represent 9,000 retail storefronts

nationally, combined with the International Auto Sound Challenge Association (IASCA), whose members include audiosound enthusiasts. In this effort, our industry's trade associations work in partnership with local government to develop alternative cruising programs in communities where this issue has become divisive. By involving community leaders, government officials, youth and others, compromises and mutually beneficial solutions to the problems can be reached.

Objectives

CASA\VSA believes that efforts should be pursued which recognize that cruising and the playing of autosound equipment by enthusiasts are basically healthy pastimes and social activities. However, means should be devised to channel and guide these interests into more positive and publicly appropriate behavior.

The playing of autosound equipment by our nation's youth is far more desirable a pastime than many other forms of entertainment. We support programs that assist youth's enjoyment of autosound, while not infringing on the rights of the public who appreciate quieter forms of recreation.

We as an industry have a vested interest in protecting the hearing of our young people, so that they can become fully productive members of our society. And, of course, we want to have a wide audience of listeners for the generation of technological advances in music and listening equipment. We support partnerships which will achieve these goals. We commend the House Select Committee on Children, Youth and Families for raising this issue and working to increase awareness of this important problem.

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July 19, 1991

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The Honorable Richard Durbin
United States Representative
129 Cannon
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Fax No. 202/225-0170 **via facsimile**

Dear Congressman Durbin:

I am the secretary and a member of the Board of Directors of Hearing Education and Awareness for Rockers (H.E.A.R.), a California non-profit public benefit corporation whose mission is to inform people of the risks of loud music to hearing, to educate them in hearing loss prevention, and to assist those afflicted with hearing loss caused by such exposure in finding some measure of relief. For example, we have produced public service announcments by prominent musicians, such as Ray Charles, which are regularly aired on the music television channels (VH-1 and MTV) abjuring listeners to respect the gift of hearing. We also conduct free hearing screening tests at the Haight-Ashbury Free Medical Clinic and other locations, mail out informational packets, and pass out literature and earplugs at concerts.

We understand that your committee is looking into the problem of hearing loss caused by exposure to portable stereos. We heartily applaud your committee's concern. We can attest to the fact that the problem of hearing loss through overexposure to loud music is very real and afflicts a great many people. Our executive director, Kathy Peck, has received a considerable number of telephone calls from young people driven to the brink of suicide by tinnitus caused by such overexposure. She would be pleased to testify before your committee on the subject.

Our educational efforts, while well-received, are not as extensive as we would like them to be due to lack of necessary funds. Your committee's serious consideration to increasing educational and informational resources in this neglected area would be welcomed.

Please be so kind as to place this letter in the Congressional Record, and please keep in mind that should your committee be interested, we do have people available to us who have firsthand experience with the problems caused by overexposure to loud music. For further information, please contact Kathy Peck at the H.E.A.R. office, or you may fax a reply to me at 415/788-1378.

Thank you again for your concern.

Very truly yours,

John Doyle

H.E.A.R. is a non-profit Public Benefit Corporation founded in 1988 by Flash Gordon, M.D. and Kathy Peck, and is recognized pursuant to Section 501(c)(3) of the Internal Revenue Code. Gifts and contributions to H.E.A.R. are tax-deductible to the fullest extent allowed by law.

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PREPARED STATEMENT OF HON. JOAN KELLY HORN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MISSOURI

I am pleased to support the efforts of our distinguished Chairwoman to emphasize programs of education and prevention in a broad array of areas affecting children, youth and families. Today's hearing on noise induced hearing loss compliments that agenda, and I commend Congresswoman Schroeder for her leadership.

Today, testimony will be received from an array of experts who have worked extensively with deaf children. One, in particular, Dr. William Clark who is a Senior Research Scientist at the Central Institute for the Deaf, located in the City of St. Louis, works with many children who live in my District. Dr. Clark has dedicated himself for many years toward the plight of the hearing impaired and speaks today with great expertise. Other witnesses offer a range of enlightening perspectives, such as that of Mr. Jeffrey Baxter, a musician and record producer who will testify about the effects of sound levels on hearing. Over the years I have often made these same claims to my six children. I wish I had access to his strong arguments during those negotiations.

I am alarmed by facts presented in the testimony, such as the fact that hearing loss is entirely preventable in 10 million of the 28 million Americans it afflicts. We need to strengthen education about the dangers associated with loudness which can affect people of all ages. Community efforts, school programs, and warning labels are all effective means of combatting this problem. When statistics show that over 20 million Americans are repeatedly exposed to "hazardous sound levels," that is 20 million Americans too many. Part of the problem is that legislation such as the Noise Control Act of 1972, which requires noise labeling, is ignored. We need these laws to be implemented.

I want to thank all of our witnesses for presenting excellent testimony on their efforts to prevent hearing loss. I look forward to working with you and my colleagues on the Committee in support of these programs.

AMERICAN
SPEECH-LANGUAGE
HEARING
ASSOCIATION

July 25, 1991

The Honorable Patricia Schroeder
Chairwoman
House Select Committee on
Children, Youth and Families
House Annex #2 - Ford House Office Bldg.
Room 385
2nd and D Streets, SW
Washington, DC 20515

Dear Rep. Schroeder:

The American Speech-Language-Hearing Association (ASHA) is pleased that the House Select Committee has chosen to hold hearings and review the issue of noise pollution in the United States and the threat it poses to the hearing and communication capabilities of our children, youth and families. ASHA is the scientific and professional association representing over 65,000 audiologists, speech-language pathologists, and hearing and speech scientists. Our members provide services to prevent, identify, evaluate and treat hearing, speech and language disorders and also perform basic and applied research into the causes and treatment of communication disorders.

ASHA has a strong interest and history in the prevention of noise-induced hearing loss. Through 1990, an ASHA committee on hearing conservation and noise addressed the many issues related to occupational and environmental noise concerns. Currently, two ASHA representatives serve on the Council for Accreditation in Occupational Hearing Conservation. Over the years, ASHA funded participants in the International Congresses on Noise as a Public Health Hazard. Since its inception, ASHA has served as an affiliate organization supporting the National Institute for Occupational Safety and Health (NIOSH)/ University of Kentucky triennial conference on noise. In addition, over the past ten years, ASHA has sponsored twelve workshops or audioteleconferences on occupational hearing conservation and community noise.

The ASHA Professional Practices and Public Information Departments provide technical assistance to members, non-members, consumers, agencies, related professional organizations, and the media on the topic of hearing conservation and noise. Our media relations office reports that noise is the number 1 topic of interest to those in both print and electronic media. The public is concerned about the effects of noise exposure on hearing.

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ASHA members are the professionals in the schools who design and implement hearing conservation programs. Audiologists also serve on the standards development committees of the American National Standards Institute and the International Electrotechnical Commission concerned with acoustics, bioacoustics and noise.

Noise and the role of federal agencies

Your hearings and investigation occur at an auspicious time as some federal agencies have targeted environmental and occupational noise-induced hearing loss as the focus of disease prevention efforts. Ironically and unfortunately, other agencies with responsibility for noise control and abatement are not fulfilling their obligations in safeguarding Americans against hearing loss. On August 9, 1991, the Administrative Conference of the United States will hold a meeting to discuss the need for a federal presence in noise abatement and control and specifically, the role of the Environmental Protection Agency.

U.S. Public Health Service

Over the past two years, ASHA has served as a member of the coalition that provided input to the development of Healthy People 2000: National health promotion and disease prevention objectives, the U.S. Public Health Service initiative for health objectives for the nation for the Year 2000. This report outlines programmatic goals for the United States that emphasize primary prevention of diseases and hazards that affect morbidity and mortality and provide measurable targets for creating a healthy society by the Year 2000. A target for reducing exposure to industrial noise for workers in industry is included (see Appendix A). In our comments, ASHA strongly urged inclusion of objectives related to environmental noise. The final report has a section devoted to environmental health that included specific objectives concerning asthma, lead ingestion, waterborne diseases, chemical poisoning, air pollutants, radon, toxic agents, solid waste disposal, drinking water and surface water. Although the chapter has no specific objectives targeting environmental noise reduction, the Research Needs section of the chapter, Environmental Health, states:

> Over 21 million Americans suffer hearing impairment. In 1988, 90.8 per 1,000 people had hearing impairments and 7.5 per 1,000 were deaf in both ears. There are approximately 28 million people in the United States with impaired hearing. Approximately 10 million of these cases are associated with loud noise. For many of these individuals, exposure to occupational and recreational noise has caused irreversible damage to the inner ear. However, it is unclear

whether the incidence of hearing impairment has risen in recent years, because few studies of noise induced hearing loss have been conducted. Additional research on the prevalence and severity of environmental noise pollution is needed so that appropriate public health protections can be implemented. (p.335)[1]

The introduction to the Environmental Health chapter of the Healthy People 2000 report identifies the Environmental Protection Agency as the agency with primary responsibility for regulating environmental hazards and with program authority to prevent and/or clean up contamination of air, water, and land (p. 316). No mention is made of noise despite the legislative mandate provided in the Noise Control Act of 1972 as amended by the Quiet Communities Act of 1978 (Public Law 92-574 and Public Law 95-609):

Sec. 2. (a) The Congress finds-
(1) that inadequately controlled noise presents a growing danger to the health and welfare of the Nation's population, particularly in urban areas;
(2) that the major sources of noise include transportation vehicles and equipment, machinary, appliances, and other products in commerce; and
(3) that, while primary responsibility for control of noise rests with State and local governments, Federal action is essential to deal with major noise sources in commerce, control of which requires national uniformity of treatment.
(b) The Congress declares that it is the policy of the United States to promote an environment for all Americans free from noise that jeopardizes their health and welfare. To that end, it is the purpose of this Act to establish a means for effective coordination of Federal research and activities in noise control, to authorize the establishment of Federal noise emission standards for products distributed in commerce, and to provide information to the public respecting (sic) the noise emission and noise reduction characteristics of such products.[2]

Administrative Conference of the United States and the Environmental Protection Agency

ASHA's input was also sought this year by the Administrative Conference of the United States on approaches to noise abatement and control and the value of a Federal noise program. We stated that the need continues to exist for a Federal agency to

coordinate noise control and reduction activities and that the Environmental Protection Agency (EPA) has been identified legislatively with such a mission. The demise of the original Office of Noise Abatement and Control (ONAC) is unwarranted, in the view of national experts in noise both within and outside the EPA. Based on current national health promotion and prevention agendas, reviving the ONAC is not only desirable, but necessary. Certainly, the emphasis on prevention of noise-induced hearing loss and allocation of resources for that purpose now, can only translate to cost-savings in health care dollars in the future. EPA's presence is needed to represent persons affected by the adverse consequences of noise.

ASHA staff in the late 1970s and early 1980s worked collaboratively with the Environmental Protection Agency's Office of Noise Abatement and Control on projects to inform the public of the risks of noise to hearing. We have enclosed copies of the following examples of EPA publications on noise that we and those we consulted still find valuable in providing technical assistance and public education on this topic:

- Think Quietly About Noise
- Quiet: Man's Best Friend
- Noise and Its Measurement
- Is Quiet Possible at the Dudley Home?
- The Quiet Schools Program
- 1972-1982 EPA Bibliography of Noise Publications
- Noise: A Community Problem, A Community Solution - The ECHO Program
- Model Noise Control Ordinance

ASHA understands that the National Technical Information Service (NTIS) became the distributing organization for the ONAC publications. Since 1982, it has been difficult to obtain many of the EPA publications and perhaps they are out of print. ASHA played a collaborative role in developing and disseminating several of the brochures. In addition, the EPA model community noise programs were most beneficial for responding to localities looking for sources of information on this topic.

Department of Labor - Occupational Safety and Health Administration

In 1981, OSHA first promulgated its Hearing Conservation Amendment, which included guidance for recording hearing loss on Form 200. The revised standard, issued in 1983, omitted this guidance for reasons that were somewhat obscure and claimed that the duty was already set forward in OSHA's "medical records" standard, 29 CFR 1904.2. That this omission has since proved to be a mistake is obvious to all involved in this issue.

Since 1983, we have been awaiting OSHA's guidelines for recordability of occupational hearing loss, the missing link in providing a strong mandate for evaluating the effectiveness of occupational hearing conservation programs. We are confused and dismayed by the current Agency position on injury and illness recordkeeping issues and occupational hearing loss (June 4, 1991). We believe that to prevent hearing impairment in the workplace, confirmed work-related STS must be the criterion utilized for recordability. Any other criterion, such as the one OSHA has recommended, will negate the purpose of the Standard and ensure inadequate documentation of this occupational illness.

ASHA is concerned that OSHA chose to sidestep rulemaking and the opportunity for public comment on an issue so crucial to the hearing health of workers in industry and the effectiveness of hearing conservation programs. As such, a coalition has been formed to protest the guidelines for recordability of occupational hearing loss and to request rulemaking be initiated for public comment in this matter.

ASHA also believes that hearing conservation regulations should be finalized for oil and gas well drilling and mining industries. Rules for oil and gas well drilling were proposed back in 1983 and extensive hearings were held in 1984. Unfortunately for the workers, no rules exist yet. In addition, there are no noise standards for either construction or agriculture industries.

Comments were also requested in 1990 with regard to noise standards for the mining industry, but as yet, no rule has been proposed by the Mine Safety and Health Administration. MSHA staff indicate that they are unsure when one will be forthcoming and tentatively target December 1991.

Current research in noise as an environmental hazard

A 1991 report of the Organization for Economic Cooperation and Development (OECD) contends that about 130 million people in 24 nations are exposed to unacceptable noise levels in their homes. Over 400 million people (over half the population) are exposed to noise levels over 55 decibels, considered uncomfortable and unsatisfactory. Over the past twenty years, the general noise environment and level of exposure to noise in OCED countries have gradually worsened. OCED represents the leading industrial democracies, including the U.S.[3,4]

The National Institute for Occupational Safety and Health (NIOSH) published a report in 1988, A Proposed National Strategy for the Prevention of Noise-induced Hearing Loss, and recommended short-and long-term objectives. The latter group included:

- Develop national consensus standards for establishing hearing conservation practices, for evaluating the properties of hearing protectors, and for evaluating product noise levels. These consensus standards will facilitate the implementation of effective hearing conservation programs.

- Develop national consensus standards to provide noise labels on newly manufactured equipment through the initiative of appropriate trade associations. These labels will inform the purchaser of the effect this equipment will have on the overall noise environment and will permit a more accurate prediction of the noise exposure an operator will receive.

- Reestablish the EPA program to implement the provisions for product noise labeling required in part by the Noise Control Act of 1972. Although the Noise Control Act is still in effect, it currently lies dormant and is not being enforced.[5]

In January, 1990, the National Institutes for Health, National Institute on Deafness and Other Communication Disorders (NIDCD), held a consensus development conference, "Noise and Hearing Loss." The report from that meeting states, "Inconsistent compliance and spotty enforcement of existing governmental regulations have been the underlying cause of their relative ineffectiveness in achieving prevention of noise-induced hearing loss (NIHL). A particularly unfortunate occurrence was the elimination of the Office of Noise Abatement and Control within EPA in 1982." In addition, the expert panel members concluded:

- Unfortunately, although NIHL is preventable, our increasingly noisy environment places more and more people at risk.
- NIHL may interfere with daily life, especially social activities that occur in noisy settings. Increased effort is required to understand speech in these situations, which leads to fatigue, anxiety, and stress.
- Hearing loss from nonoccupational noise is common, but awareness of the hazard is low.

Needed areas of research were outlined in detail and a call for enforcement of existing regulations was made.

The documentation discussed in these reports as well as that found in the Proceedings of the International Congresses on Noise emphasize the need for a coordinating agency to oversee and fund needed research as well as to promulgate and enforce regulations.

Summary

The elimination of technical assistance and the funding for research in auditory and non-auditory effects of noise have resulted in minimal efforts in these areas. The seed money for the development of hundreds of community programs with noise ordinances dried up when ONAC closed. Without a coordinating agency, uniformity in efforts is lacking and no national presence is felt. The lack of noise objectives in the Healthy People 2000 report is a clear example of the results of lack of Federal leadership in this area. Certainly, the research that had been started with ONAC funding and coordination could have made a difference in providing the needed data to justify the inclusion of environmental noise target objectives for the Healthy People 2000 report.

Many of the regulations in progress at the time the ONAC was disbanded were not completed and those regulations that were finalized lack enforcement. Additionally, we are advised that the Federal Aviation Administration (FAA) has not utilized the appropriated funding in an expeditious manner to approve and implement proposed model airport noise alleviation plans. We also believe that air transportation noise is only one part of the total transportation noise picture that requires attention.

RECOMMENDATIONS

ASHA recommends that the following actions be taken to set forth a national agenda to prevent noise-induced hearing loss in children, youth and adults:

1) the Office of Noise Abatement and Control at EPA should be restored immediately and with a full staff to implement functions previously assigned. These functions include:

o enforcement of the Noise Control Act and Quiet Communities Act as mandated by Congress;

o provide a Federal presence in making recommendations to Congress and Federal agencies with regard to an environmental health agenda related to auditory and non-auditory effects of noise;

o provide technical assistance and information to the public and related agencies on noise effects and strategies for noise control;

o resume research programs into auditory and non-auditory effects of noise:

o update noise criteria and the "Levels" document;

o restore interagency task forces to oversee and corrdinate the efforts of agencies involved in noise prevention and reduction;

o review and realistically modify guidelines for labeling of hearing protection devices and funding of studies to provide meaningful recommendations on this topic;

o develop criteria and mandate the labeling of consumer products that are excessively noisy; and

o coordinate with the FAA and other groups such as NATO and the U.S. Air Force on reducing the adverse impact of aircraft noise.

2) The Occupational Safety and Health Administration should be held accountable for enforcement of current noise standards and act with haste to develop rules to protect the hearing of workers in oil and gas well drilling, construction, and agriculture. In addition, rulemaking should be initiated to review the development of an appropriate criterion for recording hearing loss as an occupational illness on OSHA Form 200. The effectiveness of hearing conservation programs cannot be measured nor prevention of extensive damage to hearing acheived with the current guidelines.

3) The Mine Safety and Health Administration should be urged to develop a final rule for a noise standard and hearing conservation program for miners.

4) Funding for hearing conservation programs in primary, secondary and vocational schools to educate children and youth about the deleterious effects of noise on hearing, health and well-being should be allocated and model programs established. The prevention of early and inevitable deterioration of hearing should be a priority as the consequences on language development and learning of our children are significant.

ASHA supports the recommendations of NIOSH, OECD, and NIDCD related to noise control and abatement and agrees that noise is a national and international health problem. With the aging of the U.S. population, individuals are increasingly vulnerable to suffering hearing loss that is noise-induced. Multicultural populations, a growing segment of our society, are particularly vulnerable. Hearing loss as an invisible disability is too often ignored, but the ramifications for individuals and ultimately, for society as a whole, are far-reaching. Restoration of the EPA Office of Noise Abatement and Control will have a significant

impact on the reduction of noise-induced hearing loss in our nation and will set the stage for international efforts in this area.

ASHA is pleased to assist the House Select Committee on Children, Youth and Families in its investigation of the role of the Federal government in noise abatement and prevention of noise-induced hearing loss. Noise is a national and international health problem. With the aging of the U.S. population, individuals are increasingly vulnerable to suffering hearing loss that is noise-induced. Hearing loss as an invisible handicap is too often ignored, but the ramifications for individuals and, ultimately, for society as a whole are far-reaching.

If you have specific questions about our recommendations, please contact Evelyn Cherow, Director of the ASHA Audiology Division, at 301-897-5700. ASHA looks forward to learning of your findings and the results of your efforts.

Sincerely,

Frederick T. Spahr, Ph.D.
Executive Director

cc: Richard J. Durbin, M.C.

REFERENCES

1. U.S. Department of Health and Human Services, Public Health Service. (1991). Healthy people 2000: National health promotion and disease prevention objectives. DHHS Publication No. (PHS) 91-50212. Washington, DC: U.S. Government Printing Office, Superintendant of Documents.

2. The Noise Control Act of 1972 as amended by The Quiet Communities Act of 1978.

3. Noise levels generally rising, 24 nation survey indicates. (1991). Noise Regulation Report, 18(3) 19.

4. Organization for Economic Cooperation and Development. (1991). Fighting noise in the 1990s. Washington, DC: OECD.

5. National Institute for Occupational Safety and Health. (1988). A proposed national strategy for the prevention of noise-induced hearing loss. Proposed national strategies for the prevention of leading work-related diseases and injuries. Part II.

6. Shapiro, S.A., & Suter, A.H. (1991). Draft Report for the Administrative Conference of the United States: The dormant Noise Control Act and options to abate noise pollution. Technical Appendix: Noise and its effects.

APPENDIX A

The U.S. Public Health Service. (1990). Healthy People 2000: National health promotion and disease prevention objectives. Risk reduction objectives related to occupational and environmental noise include:

10.7 Reduce to no more than 15% the proportion of workers exposed to average daily noise levels that exceed 85 dBA.

Workers exposed to industrial noise may not manifest noise-induced hearing loss for as many as 10 years after initial exposure. This condition results from progressive destruction of sensory cells in the ear....Because remedial action cannot completely restore or compensate for lost hearing capacity, prevention is the key to reducing noise-induced hearing loss....Employers must be informed and encouraged to reduce the hazard to workers by controlling noise in the workplace....Current and accurate data must be collected to assess the scope of the problem and to monitor the effects of prevention and intervention efforts.

The National Institute for Occupational Safety and Health (NIOSH). (1988). A Proposed National Strategy for the Prevention of Noise-induced Hearing Loss. Short-and long-term objectives include:

- Develop national consensus standards for establishing hearing conservation practices, for evaluating the properties of hearing protectors, and for evaluating product noise levels. These consensus standards will facilitate the implementation of effective hearing conservation programs.

National Institutes for Health, National Institute on Deafness and Other Communication Disorders (NIDCD) consensus development conference, "Noise and Hearing Loss." (1990).

The report from that meeting states, "Inconsistent compliance and spotty enforcement of existing governmental regulations have been the underlying cause of their relative ineffectiveness in achieving prevention of noise-induced hearing." In addition, the expert panel members concluded:

- Unfortunately, although NIHL is preventable, our

increasingly noisy environment places more and more people at risk.

- Noise induced hearing loss may interfere with daily life, especially social activities that occur in noisy settings. Increased effort is required to understand speech in these situations, which leads to fatigue, anxiety, and stress.

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